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THE IRON TRADE REVIEW

VOLUME XXIII. CLEVELAND, O., JUNE 19, 1890. NUMBER 25.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
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CLEVELAND, O., JUNE 19, 1890.

THE WEEK IN IRON CIRCLES.

General Features. The monthly statement of the condition of the blast furnaces for June 1st shows an increased production, notwithstanding a decrease of six stacks in the active list. The steel rail market is not in a particularly encouraging condition, though some sales of considerable size have recently taken place. The coke trade shows an improved condition, shipments having materially increased during the past week. What is doing in Central Western markets is indicated in the reports summarized below: As predicted by our Detroit correspondents, Wm. F. Jarvis & Co., from the unusually large inquiry for Lake Superior charcoal iron which they noted in their report of last week, the transactions in the aggregate for this grade of metal were probably larger than in any previous week in the history of the trade. Nearly every buyer of Lake Superior charcoal iron was on the alert and desirous to close for as large a supply as can be delivered to them during the present season. It would be difficult to say what the tonnage amounted to, but it is way up in the tens of thousands of tons. Notwithstanding all this, there is still left unsatisfied a number of inquiries for considerable amounts. It does not seem possible that the market can fail to appreciate the stimulus that this buying must give. Prices remain firm, but no advances have yet been made. The months of June and July are now about the only large buying season for Lake Superior charcoal iron, although of course there is a steady trade during the entire year, but the large buyers, requiring iron to be carried by lake, are obliged to make their contracts early, to be certain of getting the quantity they want prior to the close of navigation. There was considerable inquiry for Southern and Jackson County silveries, in small lots, which resulted in some trade, but of no great magnitude. The market seems firmer each day, and the outlook more hopeful. Activity in all kinds of iron continues in Chicago and the Northwest. The tonnage of pig iron orders booked the past two weeks has seldom been exceeded for an equal period. The demand has been principally for Lake Superior charcoal, the local irons and Southern irons. In view of heavy orders placed, and more in sight, it is a little surprising that prices have not shown greater firmness. Southern coke brands are up 50 to 75 cents per ton and firmly held, but on other classes of irons the leading buyers have been able to supply their wants on very favorable terms. Considerable car wheel and malleable iron has been sold. Ohio softeners are in steady request. Old rails and wheels are higher. The foundries are all busy and the feeling is generally hopeful. The recent advance of 50 cents on Southern iron, and the relative scarcity of certain grades for early deliveries, have to some extent checked the buying movement at St. Louis; but consumption continues active, and prospects are good for a continued strong market. Cincinnati reports a quiet week. Nevertheless a good amount of business was rounded up. The malleable concerns, car wheel works and agricultural implement works have been the heaviest purchasers, charcoal irons have therefore been a more prominent feature than before. Large lots of Lake Superior charcoal iron were bought for malleable purposes, and it is understood the purchases are not concluded. Prices in charcoal irons, both Northern and Southern, have shaded off slightly under the urgent competition for special desirable trade. This has no bearing on the coke iron situation, as charcoal irons did not decline proportionately with coke irons. In Southern coke brands, there are few offerings, the furnaces being well sold up, and holding for 50 cents per ton advance, which buyers are disposed to resist. The Southern market still continues to improve, both as to price and demand. Furnaces have booked well ahead for some months, and as the situation is improving they do not seem disposed to sell to any length, believing that the market is in their favor, and many believe that the market will go considerably higher. One thing greatly to be feared is a general strike throughout the furnace districts. Should this occur, it is the opinion of many that it would be a long-continued one, in which event there will be few furnaces which will be able to supply their present obligations.

Iron Ore. The situation is very quiet and the demand for Bessemer ores that manifested itself some weeks ago by numerous inquiries and some few sales, seems to have fallen off again. Non-Bessemer ore does not move at all. There is not the improvement in the general business as to induce consumers to purchase ore at the increased price over that paid last season, while on the other hand the ore men, having sold enough last Fall to feel somewhat independent, are not offering any concessions. The vast majority of furnaces are supplied with ore only to July 1, and a few until August 1, so that unless some considerable sales are reported within the next ten days or two weeks, no one need be surprised to hear of many a stack going out of blast. Charters are fairly plenty, the Ashland rate being $1.20, with Marquette at $1.10 and Escanaba at 85 cents. The syndicate fiend is abroad again, this time with extraordinary persistency. Half a dozen mines have been sold during the week at prices to suit the gossipers, but in each case inquiry has resulted in a general denial by all the parties concerned. The only cause for these rumors is the fact that there is unlimited capital seeking investment in dividen-d daying mines—and these, as a rule, are not in the market. The local strike in the railroad yards is causing serious inconvenience to a number of furnaces in the adjacent iron districts who, having little or no storage facilities, depend upon their ore supply from week to week, and who in some instances are without ore.

Pig Iron. The market is quiet and firm. Considerable iron is being sold at fairly good prices, but while the outlook is very good for the last half of the year, furnace-men are not so certain as to the immediate future or the time of a general advance. Furnaces as a rule are comfortably situated with regard to orders and are rather conservative as to sales. There is a large movement in charcoal iron which bids fair to hold out for some little time to come. Bessemer iron for immediate delivery and in comparatively small lots, commands $18.50 cash at the furnace, or about $19.25 here; larger lots, or orders intended for August and September delivery, could not be placed for less than $19, if at that. The foundry market is dull, a good cinder mixture being quoted at $17.50. Both furnaces and mills are running short on fuel, owing to the cause already stated, and unless the local strike should be quickly ended, there will be a general stoppage of work in a very few days.

Merchant Iron. The bar iron trade is fairly good as to the volume of sales, but is hardly satisfactory regarding quotations. Sheets remain scarce and high, and will advance as the mills shut down for their annual repairs.

Hardware. While the general trade is inactive—unusually so for this season—metals are very strong and scarce. There has been an advance all along the line, both lead and spelter showing great strength. Copper, particularly, is booming, and the trade reports indicate the absence of any speculative movement at this time. An immense quantity of copper is going into consumption, and the advance since November amounts to nearly fifty per cent., the present price being about 15 cents, while lake copper is a cent and a half above that.

A REPLY AND A PREDICTION.

During the past two weeks it seems to have afforded our esteemed contemporaries especially representing the iron ore interests in the Lake Superior country considerable amusement, and no little amouut of satisfaction, to take *The Iron Trade Review* to task for what our friends are pleased to term "inconsistency" in our market reports, and for taking either the "bull" or "bear" side of the question—according to the divergent views entertained by the different interests represented in the columns of our Lake Superior friends.

While we should regret to say or do anything that might in the least curtail this harmless amusement our friends seem to enjoy so immensely, we are constrained to say that we have not a single correction to make, not a solitary word to take back. We report the market as we find it expressed by the opinions of the gentlemen in whose hands lies the direction of the ore business. They are neither mining superintendents, nor, as a rule, interested stockholders in mining enterprises. They are the men who sell the ore, who feel of the consumers' pulse, and who are eminently in a position to speak intelligently upon this subject. When the business outlook is good in their opinion, our duty as reporters of current events ceases with the publication of that fact. When trade is dull and the iron ore dealers furnish that information, the intelligence is similarly conveyed to our readers, just as it comes to us. This, in the opinion of people who cannot see further than their nose, may be inconsistency—but their number is few and they count for very little.

If ever there was a time when a market was made by a newspaper, that time is past. In the iron ore business the seller knows no better what he can sell his products for than the consumer knows what he can buy it for. In the iron ore, as in any other business, wants manifest themselves—they are not created; and so no amount of market reports (contrary to the truth) can induce a man to sell when he does not want to sell, any more than they can work upon another man to buy when he has no need of buying. This, it seems to us, ought to dispose of the "bull" and "bear" story. To us it sounds more like a cock and bull story.

Lest, however, our friends should imagine that we are quite contented to voice the impersonal opinion of the market, we are willing to advance an opinion of our own regarding the probable output of 1890—and we do it editorially, since we are not in favor of mixing our editorial comments with the news reports on our market page. Our forecast of the iron ore output in the Lake Superior country for the season of 1890 is 7,800,000 tons. Our friends are invited to come along with their several guesses.

THE MANNESMANN PROCESS OF MAKING STEEL TUBES.

We have before us a very interesting paper read by Mr. J. G. Gordon before the Society of Arts, London, on May 21st, descriptive of the Mannesmann process for making seamless steel tubes. This novel process is now in use at five works on the Continent, and in Great Britain, viz.: the parent works at Remsheid in Rhenish Prussia; then another works in South Germany, at Bous, near Saarbruecken; the Austrian works at Komotau; a works near Duisburg, which is specially erected for making tubes of copper and its alloys; and, lastly, the works at Landore, near Swansea, Wales. The process of manufacture is very peculiar and must be intensely interesting to those who have made a study of the mysterious qualities of steel. To put it in very homely language, it consists in turning the piece of metal inside out, or rather, drawing the material of the outside of the tube over the inside—in other words, like taking a fox's skin over his ears. Stripped of technicalities, the *modus operandi* appears to be this—that while a series of grooved rolls is rotating at a high rate of speed, they tend to force the outer part of the metal forward, while the grip with the part of the rolls which is close together tends to retard the flow of the whole metal. The grooves push forward the outside of the metal, which is plastic, being at a high temperature, while by the grip of the roll the inner part is retarded, and thus formed into a cup shape, and consequently into a tube. To use another illustration—supposing the experimenter had a solid circular stick of putty, and he held that putty in his left hand at one end, while he took his right hand and drew the putty endwise; if he held the putty quite firmly the probability is that he would succeed in drawing out a sort of skin, which would come beyond the end of the solid putty. One might have hold of a material, letting it go only gradually, while causing the outside to go forward at a greater pace, and in that way, by perpetually drawing forward the outer coating, he might succeed in converting a solid bar into a tube.

This is precisely what occurs to the steel bar when inserted in the rolls in the Mannesmann process, and we could not give a clearer idea of it if we were to copy entire Mr. Gordon's very valuable paper. These tubes have been put to the severest tests and have shown marvelous strength. But the severest test which the Mannesmann tube can possibly be subjected to is the process of manufacture itself. If the metal is homogeneous throughout, and well melted, well rolled, and carefully heated, it makes a perfect tube, or, at any rate, a near approach to it; but if there is any flaw in the bar, or if the furnace-man has been careless in the heating, then the Mannesmann rolls reject that bar, by refusing to make a tube of it, more sternly than the severest human inspector would. This process is, in fact, so far as regards what is called humoring the metal, to the ordinary rolling process what the tilt hammer is to the late Mr. Nasmyth's steam hammer, so that every tube made by this process comes into the world ready tested.

Besides being used for all the purposes for which ordinary tubes are made, it is also applicable to hollow axles for railway and other cars, and especially for field gun carriages. The Prussian Government have already given the German Mannesmann works large orders for military stores of various kinds, or rather for the tubes from which to make them; for instance, the lances with which the whole of the German cavalry are about to be armed are to be made of Mannesmann tubes, and are now in course of manufacture.

The Mannesmann tubes exhibit a high tensile strength, in comparison with their weight per pound. While cast iron pipes will hardly stand more than 200 lb. per square inch, and welded tubes are not as a rule safe above 1,000 lb. per square inch, the Mannesmann easily withstand 2,000 lb. per square inch. The length up to which these tubes can be easily made is shown by this coil made of a tube three inches in internal diameter, and about ¼ in. thick by 70 ft. long; it weighs about 6½ cwt.

Three or four years ago *The Iron Trade Review* published a description of a process of making seamless tubes by forcing metal disks through mandrils by hydraulic pressure. Experiments were conducted at the Otis Steel Works, in this city, but we are not aware that anything ever came of the project. The Mannesmann process, however, is an entirely different system.

BRITISH IRONMASTERS GET THEIR EYES OPEN.

The *Iron and Coal Trades Review*, of London, continues to print the opinions of leading British ironmasters regarding the evils of pig iron warrants. From a number of these, in its issue of May 30, we take the following pungent paragraphs:

A late manager of important works in the Merthyr valley writes:

I should not be a bit surprised if this pig iron gambling is not checked it will spread to tin-plates. Here in Wales we have numerous small men, or needy companies, who would have artificial aids—stimulants we may call them—because there is the recurring reaction. It is gratifying to feel that in Wales we are not plunged into the miseries attendant upon a misuse of the warrant.

A West-Coast manager suggests that the iron men themselves buy up the warrant stocks. He says:

Warrant stocks, which have been reduced since the beginning of the year to the extent of over 60,000 tons, now represent 320,000 tons, and at the present market price are worth £850,000. Now, in my opinion, the banks would advance on these warrants 40s. per ton, which would leave £210,000 to be raised. This is a mere trifle among a combination of ironmasters, and what would be the result if it were done? Why, the makers would at any rate be able to have that controlling influence in the market which the capital they have invested in the trade entitles them to. This experiment is well worth the trying, and I submit it is by far the most practical way of solving what otherwise will be found a difficult problem.

Mr. Joseph G. Wright, of Monmoor Iron Works, Wolverhampton, treats the subject without glories, as follows:

The rapid communication by telegraph in these present days has altogether altered the conditions of trade which existed in former years. What happens to-day is known to-morrow in every commercial centre in the world. The result is that the fluctuations of trade and of the prices of commodities are more quickly manifested, and, therefore, more numerous than formerly.

Any circumstances, therefore, which operate to increase the extent or the frequency of these fluctuations tend to make the current of ordinary trade flow irregularly in proportion to the violence of the operating causes.

In this way speculative buying and selling has a very unhealthy effect upon legitimate trade by forcing prices at a greater rate or to a greater extent, than the natural relative conditions of supply and demand justify.

The existence of large public stores of pig iron in excess of trade requirements alone makes this speculation in pig iron possible, and thereby the legitimate course of trade is seriously prejudiced. Great loss accrues to manufacturers in consequence of the artificial prices of the warrant-stored iron when those prices are unduly depressed as at present.

The unnatural fluctuations brought about by speculations in warrants also induce a speculative spirit in the purchasing of materials by manufacturers, and the evil effects of such speculation are often little less diastrous than the more direct gambling in warrants.

There is also the social aspect of the question, which is too important to

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES

June 1, 1890.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Week'y capacity.	CHARCOAL. Out of Bl'st. No.	CHARCOAL. Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	BITUMINOUS OR COKE. In Blast. No.	BITUMINOUS OR COKE. In Blast. Week'y capacity.	BITUMINOUS OR COKE. Out of Bl'st. No.	BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity.
New England	13	6	501	7	585	.....	.....	.....	.....	.....
New York	9	1	182	8	968	4	3	3,326	1	490
Pennsylvania	17	4	324	13	720	1	0	0	1	600
Upper Susquehanna Valley	.....	.....	.....	.....	.....	1	0	0	1	200
Pittsburgh	.....	.....	.....	.....	.....	20	18	24,941	2	3,053
Spiegel	.....	.....	.....	.....	.....	2	2	1,481	0	0
Allegheny Valley	.....	.....	.....	.....	.....	2	0	0	2	656
Shenango Valley	.....	.....	.....	.....	.....	19	15	11,874	4	2,450
Youghiogheny Valley	.....	.....	.....	.....	.....	5	4	2,194	1	132
Juniata and Conemaugh Valleys	.....	.....	.....	.....	.....	19	11	6,419	8	3,089
Spiegel	.....	.....	.....	.....	.....	1	0	0	1	250
Maryland	8	3	294	5	478	4	3	2,732	1	140
Virginia	19	2	113	17	911	12	9	5,294	3	931
North Carolina	2	1	98	1	85	.....	.....	.....	.....	.....
West Virginia	3	0	0	3	190	6	4	2,609	2	580
Ohio—Mahoning Valley	.....	.....	.....	.....	.....	14	10	8,979	4	2,899
Eastern, Central and Northern	.....	.....	.....	.....	.....	18	13	10,553	5	3,044
Hocking Valley	.....	.....	.....	.....	.....	15	4	1,451	11	2,598
Hanging Rock	12	5	881	7	590	13	8	1,798	5	865
Miscellaneous	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kentucky	.....	.....	.....	.....	.....	5	3	862	2	720
Hanging Rock	1	0	0	1	116	.....	.....	.....	.....	.....
Western Region and Miscellan'ous	2	0	0	2	154	.....	.....	.....	.....	.....
Tennessee	8	4	1,102	4	355	12	8	2,923	4	1,333
Georgia	3	2	238	1	98	2	1	488	1	675
Alabama	14	11	2,167	3	980	37	26	17,287	11	4,646
Indiana	.....	.....	.....	.....	.....	2	2	323	0	0
Illinois	.....	.....	.....	.....	.....	17	12	12,929	5	3,477
Michigan	26	13	4,182	13	3,684	1	0	0	1	300
Wisconsin	6	4	1,898	2	190	4	4	2,957	0	0
Minnesota	.....	.....	.....	.....	.....	1	0	0	1	140
Missouri	2	2	598	0	0	6	3	1,994	3	1,720
Texas	1	1	180	0	0	.....	.....	.....	.....	.....
Oregon	1	1	243	0	0	.....	.....	.....	.....	.....
Colorado	.....	.....	.....	.....	.....	2	1	406	1	350
Utah	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	1	0	0	1	205	.....	.....	.....	.....	.....
Total charcoal and coke	148	58	13,001	90	10,309	245	164	123,820	81	35,338
Total anthracite	178	118	45,132	60	17,948	.....	.....	.....	.....	.....

SUMMARY.

FUEL.	IN BLAST. Number. Month Previous.	IN BLAST. Number. Year Previous.	IN BLAST. Weekly Capacity. Month Previous.	IN BLAST. Weekly Capacity. Year Previous.	OUT OF BLAST. Number. Month Previous.	OUT OF BLAST. Weekly Capacity. Month Previous.
Charcoal	58	53	66	13,001	11,474	11,577	90	94	10,309	11,703
Anthracite	118	122	97	45,132	48,853	34,514	60	56	17,948	14,879
Bituminous	164	166	129	123,820	120,529	83,591	81	81	35,338	39,503
Total	340	341	292	181,953	180,856	129,682	231	231	63,595	66,085

be ignored. In such times as we have lately passed through, the craze for speculation extends far beyond the ordinary commercial circles. Private persons, even clergymen and clerks, are fascinated and led on by the chance of gain to what is often lifelong suffering and not unfrequently ruin.

These considerations lead one to the conclusion that gambling in pig iron warrants has a very prejudicial effect on trade generally, as well as on the public weal, and that if by any means it could be prevented, a great moral, social and economical reform would be effected.

The manager of a leading Staffordshire iron works draws this striking picture of the situation:

I have for a long time considered that the practice of speculating or, in other words, gambling, which exists in connection with the stocks of pig iron warrants in Glasgow, Middlesborough, etc., has had a most pernicious effect upon the iron trade of this country. This gambling, such as within the last few months has taken place, has been the cause of great loss to many families, who, with the exception of speculating in these warrants, are in no way connected with the iron trade, and who have been induced to invest their capital by unprincipled persons, acting as brokers for their own gain and personal interests.

The result of this has been a collapse of trade, for these people, as soon as a scare was caused by certain operators on the market, offered to sell their iron at a lower price, causing a check upon buyers of finished iron, who upon the first signs of weakness in prices withheld their orders, expecting to see prices recede further. To many of the above families referred to, it has brought ruin, and in some cases suicide and death have followed.

In the opinion of Mr. Alfred Hickman, "undoubtedly the store warrant system has been productive of immense mischief to the trade, and the present depression under which we are suffering is, in my opinion, due entirely to it."

The general manager of another well-known Staffordshire iron works states:

Our views shortly are that gambling in warrants upsets the whole foundation of legitimate trade, and that unless it is prevented, or warrant stocks wiped out, we shall always be, more or less, at the mercy of hot-headed speculators, who rush in greedily, and who not only ruin themselves, but also cripple the industry of the country.

Such has been the experience of British iron manufacturers, and this is the feast to which the promoters of pig iron gambling in this country invite the American iron trade. If we are wise enough to be taught by the experience of others, we will have none of it.

THE DUTY ON STEEL RAILS—STATISTICS WHICH END ALL CONTROVERSY.

In a paper contributed to the *North American Review* for February, 1890, in continuation of the Gladstone-Blaine tariff controversy, the Hon. Roger Q. Mills, of Texas, very unwisely undertook to sustain the Free Trade theory that the duty imposed by our tariff on a manufactured product is added to the normal price of that product, whether it be of foreign or domestic manufacture, and that the purchaser of that product is compelled to pay this enhanced price.

It will be remembered that Mr. Cleveland enunciated the same theory in his celebrated annual message of December 6, 1887, in which he said that, "while comparatively a few use the imported articles, millions of our people, who never use and never saw any of the foreign products, purchase and use things of the same kind made in this country, and pay therefor nearly or quite the same enhanced price which the duty adds to the imported articles."

Mr. Mills quotes some steel rail statistics for the years 1870 to 1873, which he says, sustains his theory. He might have quoted statistics for still earlier years which would have been equally favorable to his argument. But why did he stop with the figures for 1873? Let the following table, which shows the rapid decline in the prices of domestic Bessemer steel rails, and the cost of imported British rails, with freight and duty and all other charges paid, answer Mr. Mills's whole argument:

Calendar Year.	United States. Production in gross tons.	United States. Imported in gross tons.*	United States. Duty.	United States. Average price of gold.	United States. Average price of rails in curren'y.	Great Britain. Price in gold f. o. b. at British ports.	Great Britain. Cost in currency at American ports.
1867	2,277	145,579	45 per cent. ad va'orem.	138	$166 00	$65.70	$135.60
1868	6,457	223,287		140	158 50	61.32	128.68
1869	8,616	279,610		136	132.25	54.99	112 52
1870	30,357	356,387		1 5	106.75	50.37	87.44
1871	34,152	505,538	$28 per ton from Jan. 1, 1871, to Aug. 1, 1872; $25.20 to Mar. 3, 1875; $28 from that date to July 1, 1883.	112	102.50	54 59	96.31
1872	83,991	133,738		112	112.00	67.64	110.48
1873	115,192	144,474		113	120.50	80.05	122.32
1874	129,414	89,746		112	94.25	68 75	108.58
1875	259,699	16,316		114	85.75	44.28	85.82
1876	368,269	none.		110	59.25	32.12	69.43
1877	385,865	31		105	45.50	29.20	63.21
1878	491,427	9		102	42.25	25 55	57.68
1879	610,682	22,372		100	48.25	26.88	57.88
1880	852,156	141,277		100	67.50	34 42	65 42
1881	1,187,770	222,596		100	61.13	32.41	61.41
1882	1,284,067	162,621		100	48 50	26.27	57 27
1883	1,148,709	34,125		100	37.75	22 72	53.72
1884	596,983	2,745		100	30 75	23.19	43.19
1885	959,471	2,138		100	28.50	23.11	43.11
1886	1,574,703	41,581	$17 per ton from July 1, 1883.	100	34.50	18.70	38.70
1887	2,101,904	137,588		100	37.68	19.70	39.70
1888	1,386,277	63,016		100	29.83	19.15	39.15
1889	1,510,057	6,202		100	29.25	24.57	44.57
1890 (June price)	.....	.....		100	31.50	23.10	43.10

* The imports from 1867 to 1870, inclusive, include both iron and steel rails.

The prices of British steel rails at British ports from 1867 to 1878, inclusive, are taken from a statement presented by Mr. H. V. Poor, to the Ways and Means Committee of the House of Representatives in February, 1880; for 1879 the price is an average from Fossick's chart, an English statistical publication of high standing; and from 1880 to 1890, inclusive, the prices have been averaged from weekly English quotations in the New York *Iron Age*. Mr. Poor's figures represent average quotations. All the other figures in the table are compiled from the statistical records of the American Iron and Steel Association.

Down to 1874 our steel rail industry was in its infancy, and domestic prices were necessarily high because we had not perfected the methods of production; whereas Great Britain, our chief competitor, had then fully developed her steel rail industry, and was supplying steel rails to the world's markets. In each of the years prior to 1874 she exported to this country more steel rails than we were able to make. After 1874, as the column of production in the table shows, we began to make steel rails in large quantities.

From 1873 to 1890, a period of seventeen years, there are only *two years*, 1880 and 1881, in which the table sustains the Free Trader's plea that the duty has been added to the foreign price of steel rails and to the charges for commission, insurance, and freight, a fair average of which on our imports of steel rails during the whole period covered by our table may be placed at $3 per ton. These charges, added to the duty of $25 20, would make the gold price of domestic steel rails in 1873 and 1874 $28 20 per ton greater than the price of British steel rails; from 1875 to 1883, added to the duty of $28, it would make their price $31 per ton greater; and from 1883 to 1890, added to the duty of $17, it would make their price $20 per ton greater. No such enhanced prices have been charged by our manufacturers in any of the seventeen years from 1873 to 1890, except in 1880 and 1881, and it is well known to every person who cares to be well informed about our industrial history that the comparatively high prices of domestic steel rails in these two years were due to the boom which commenced late in 1879, and which for some time afterwards kept all our markets excited, including the prices of all the raw materials entering into the manufacture of steel rails.

A careful examination of the table will show that during many of the years from 1873 to 1890 the domestic price of steel rails has not only been much lower than the British price, with duty, freight, etc., added, but that it has been *very much lower*. This was conspicuously the case in 1877, 1878, 1879 and 1882, and more recently in 1884 and 1885, and again 1888, 1889 and 1890. In all these years American rails were from $9 to $18 per ton cheaper than British rails with freight and duty paid. At the beginning of 1890 the price of steel rails in Great Britain and in the United States was *exactly the same*, $35 per ton, and the price in the two countries ruled at these figures for two months.

In the whole range of our protected industries we do not know of one whose history more completely refutes the theory above referred to than our

magnificent steel-rail industry. A Protective duty on foreign steel rails has not only built up an immense steel-rail industry in our country, and placed us for many years at the head of all steel-rail-making countries, but it has reduced the prices of domestic steel rails to such low figures that American railroad managers never think now of asking Congress to reduce the duty that they may import cheap foreign rails. So far from Mr. Mills's and Mr. Cleveland's theory being correct when applied to steel rails, nearly half a million tons of domestic steel rails have been sold during the past few years below the duty of $28 a ton, which was imposed twenty years ago when our steel-rail industry was in its infancy. But $28 is a hard-times price.

The necessity of guarding our manufacturing industries against the lowest prices of foreign competing products has frequently been dwelt upon by Protectionists as a good and sufficient reason for the retention in the tariff of many rates of duty which at first sight seem higher than is required to prevent ruinous competition from abroad. It is not against high or even intermediate foreign prices that our manufacturers need protection, but against low prices, and particularly the lowest prices. The European markets go up and down as do our own. Steel rails afford a good illustration of the needed protection referred to. In January and February, 1890, English steel rails cost £7 5s., or about $35, per ton, delivered on board vessels; in May the quotation was £4 17s. 6d., or about $23 75, a fall of more than $11 per ton in three months. In August, 1888, English steel rails were quoted at £3 12s. 6d., or $17.63 per ton, and from May to August, 1886, they were regularly quoted at £3 7s. 6d., or $16 42. The quotations in 1886 and again in 1888 were doubled the early part of 1890. We do not need protection against British steel rails at $35 per ton, but against steel rails at $16 42 per ton.

Free traders are conspicuously uncandid in utterly ignoring the fact that home competition in the manufacture of steel rails was needed to bring down the prices of foreign steel rails in our markets, and the further fact that we could not have had this competition without a Protective duty. They will not have the hardihood to pretend that we could have built up our immense steel-rail industry without Protection, or that, having failed to so build it up, the prices of foreign steel rails in any market could ever have been so low as they have been. For a number of years this country has annually made over one third of the world's annual production of steel rails.—[Bulletin of the American Iron and Steel Association.

The Longest Girder Ever Made.

The Keystone Bridge Co. has just completed a girder for the new City Hall of San Francisco, which is the largest ever made in the United States, so far as the members of the firm know. It is 105 feet long, and weighs 70 tons. A contract for two girders was given to the company last November, and they have been working on it ever since. The materials for the second one are now being prepared. The girders are intended for the ground floor of the building.

The great problem now is to transport it to the Pacific coast. The Chicago & Northwestern and Union Pacific roads have undertaken the job. The long monster yesterday was lying on three of the largest freight cars obtainable on the Allegheny tracks. Mr. E. H. Utley, the freight agent for Carnegie, Phipps & Co., stated that it was necessary to put in additional trusses to distribute the weight evenly on the three cars. As the cars are constructed, the weight of the girder fell on the centers, and the cars would hardly stand the strain. Mr. Utley thinks that the way it is placed in the cars will allow it to go around the curves all right. The usual plan for shipping girders is to carry them in pieces and have the plates riveted together at the place of destination. The company was afraid they didn't have the facilities on the Pacific coast to do the riveting. The second one will not be built until they see whether or not it can be transported. The average car in the West will carry about 15 tons, and Mr. Utley says should anything happen to either of the three cars the road would have some trouble to replace them.—[Pittsburgh Dispatch.

Paneled Iron Ceilings.

Patent paneled iron ceilings have been before the public for the past eight or ten years, and now there are thousands in use, scattered all over the Union, in stores, banking offices and hotels, while their superior acoustic properties have brought them into extensive demand for churches, halls and opera houses. Their low cost and cleanliness introduce them into schools and asylums. And the increasing demand for something to take the place of plaster for residence ceilings, something that would gratify the artistic taste of our most cultivated housewives, and still be permanent and enduring, and thus save them the constant annoyance and expense of re-plastering and re papering; something that could be applied over the old broken plastered ceilings without being compelled to take down and remove the dirt and dust-covering stuff, has prompted the makers to bring out beautiful designs of embossed metal plates. These embossed plates are adapted to side walls as well as ceilings, working up beautifully into wainscoting, frieze and field. As all figures and designs are in relief, really very little brush decoration is needed. They are, however, susceptible of any desired degree of ornamental decoration from simple, quiet tinting to the most elaborate and ornate display of coloring, gilding and bronzing, giving abundant scope for display of taste and talent to the most gifted decorative artists.

Iron in Utah.

In another column the Real Estate Exchange of Salt Lake City, Utah, invites correspondence and propositions from iron manufacturers, looking toward the development of the vast iron ore beds of Utah. Till now the want of native coke has been the drawback, but they now believe they have home coke, from the Castle Gate mines, that will do the work perfectly. It goes without saying that when the Rocky Mountain country begins to manufacture iron with plenty of coke at hand to work it, a vast market will be controlled there. It speaks well for the spirit of the people of Utah that they are working to this end, and believe they have solved the problem, and are ready to meet and welcome and assist outside capital to develop their iron and coal possibilities.

CONDITION OF EUROPEAN IRON MARKETS.

The reaction which a few weeks ago set in in the iron markets of the Continent is making constant progress. In the main, this is the work of the coal-producers, who, by running up their prices to an altogether abnormal level, have so increased the cost of iron that home consumers have been compelled to abandon or to curtail some of their projects, and the export merchants have been rendered incapable of competing with foreign rivals more favorably placed. Nothing but the high cost of coal now prevents a complete collapse of prices for iron, and so far, perhaps, the firm attitude of these coal-owners is beneficial to the iron trade. But the restricted consumption of coal, due to the loss of trade in iron and some other manufactured goods, tends to bring down the price of coal, and as the cost of the latter becomes less, the prices of iron must decline. The only locality where there is now anything approaching activity is Upper Silesia. In that district the market continues animated both for crude and for finished iron, and prices are firm at the lower level reached a week ago. In Western Germany languor is the dominant note of the situation. Belgian trade has had the life pressed out of it by the burden of excessive prices for coal, and so long as the latter remain at anything like their present level, it is vain to hope for improvement. In France the markets have taken an unfavorable turn. The demand, never very strong, is declining, and manufacturers now show a disposition to give way in the matter of prices.

In the markets of Eastern Germany there is no appreciable diminution in the strength of the demand for pig iron, and consequently no weakness in prices. Very different is the situation in the Rhenish-Westphalian provinces. There the demand has shrunk to almost nothing. As there is practically no business doing, prices must be regarded as merely nominal. But it is worthy of note that the official quotations are lower in some instances than they were a week ago. Thus ordinary spiegel pig is freely offered at 97s. to 98s., and Siegen forge at 78s. a ton. Iron in second-hands can be bought several shillings a ton below manufacturers' prices. In Belgium business is almost at a standstill. The blast-furnace owners have largely restricted the production; but stocks continue to accumulate. It is difficult to ascertain what the prices are, both merchants and manufacturers being willing to take whatever they can get. In France the markets are very weak. The demand for pig has greatly fallen off, and that the tendency of prices is decidedly downward is significantly shown by the fact that Longwy forge is offered at Charleroi in Belgium at 49s., a price that leaves but 4s. for the manufacturer.

Business is active in Upper Silesia, bars, joists and plates being in brisk demand. But there is very little doing in the Dusseldorf market. Joists are in fairly good demand; but bars, hoops and wire are almost wholly neglected, while plates are fast becoming a slack market. The loss of the foreign trade is now keenly felt. Consumers are holding back for lower prices. Belgian trade shows no symptoms of immediate recovery. Manufacturers work but three and four days a week; but even this production is in excess of the requirements. As in Germany, consumers are keeping back orders till the latest moment in anticipation of yet lower prices. In Paris, a little spurt of business in joists has encouraged the merchants to assume a firmer attitude in the matter of prices. But in the provincial markets, the demand for all classes of finished iron and steel is falling off, and manufacturers are no longer firm in their refusal to make concessions to buyers.—[Colliery Guardian, London.

The Riedler Compound Pumping Engines.

In a paper read by Mr. E. D. Leavitt before the Boston Society of Civil Engineers, a few weeks ago, reference was made by the writer to some wonderful pumping machinery which he found at work in a coal mine at Kladnow, some twenty miles from Prague, during a recent visit to Europe. This machinery, Mr. Leavitt states, is fixed 1,700 ft. below the surface, and consists of two pairs of compound pumping engines, driving double-acting plunger pumps of 28 in. stroke for one engine, and 3 ft. stroke for the other, raising the water against the whole head of 1,700 ft., and running at a speed from 40 to 72 revolution per minute with entire smoothness. The pumps are the invention of Professor Riedler, of the Polytechnique Institute, at Berlin, and his system is coming rapidly into use on the Continent of Europe. Similar pumping engines are in use at the waterworks at Rotterdam, the regular speed of which is 60 revolutions per minute, the stroke being 3 ft. The head there is about 100 ft., and the pump works with entire quietness, while the engineer states that the slip is hardly appreciable, although the valves lift about 2 in., there is only one valve for suction, and one for delivery, at each end of each pump.

Electricity is not Manufactured.

The courts of Pennsylvania are trying to settle the question whether or not electric light companies are manufacturing companies. Manufacturing companies are exempt from taxation in that state under certain conditions, and the courts hold that electric light companies do not manufacture anything; that electricity is not manufactured; they do not manufacture light. The question will probably be carried to the highest court before being settled. As manufacturing consists of increasing the value of raw material, electric light companies do not come within the meaning of manufacturing.—[North Western Mechanic.

IT is said that the water-works in the United States and Canada have about trebled in the last ten years, growing from 665 in 1881 to 1,900 to-day. The capital invested is $500,000,000, their annual revenue is $50,000,000, their mains are 30,000 miles long, and they have 2,000,000 taps.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

VERMILION RANGE.

Some specimens of lean red ore have recently come in from a location forty miles due west of here, and eighteen miles north of the supposed trend of the Vermilion range. From the descriptions given by the parties who made the discovery, the ore does not outcrop in a body, but is intermingled with chloritic slates, jaspery rock and red oxidized earth. The strip of iron bearing rocks are very narrow, can be traced for several miles and flanked on both sides by a granite formation. Iron experts are non-committal in their opinions as to any quantity of ore existing in a formation of that kind.—[Iron Journal, Tower.

MESSABIE RANGE.

The *Press* learns from H. Pratt some facts in reference to the operations on the Messabie range. Nearly three years ago, two companies in which Mr. Pratt is interested—the Washington and Michigan—both located at Ypsilanti, Mich., began operation on section 22, town. 42, north 1 east. About three months ago, they came upon a vein of black magnetic ore on both options, which, so far as has been developed, is about thirty feet wide. They struck this vein in a cross-cut about seventy-five feet from the surface and are now sinking a large working shaft directly above the vein. About a month ago, they had an assay of the ore made at the assay office of the Cleveland Rolling Mills which gave 63 per cent. iron and less than .0050 phosphorus. They are now endeavoring to induce a railroad to run a line to the mines and expect to be ready to ship ore as soon as shipping facilities can be had.—[Ashland Press.

GOGEBIC RANGE.

Ashland people are having a run of luck in the direction of mining ventures. The latest strike reported was made a day or two ago on the Ruggles Mining Co.'s property, near Upson. At a depth of 140 feet, the men working in a cross-cut struck a fine vein of soft hematite. The men have gone through ten feet of ore and are still working in it.—[Press.

At the Joliet a new shaft is being sunk vertically and is down about 95 feet, being part in surface and the remainder in a mixed formation of jasper, quartzite and lean ore. About 80 feet from surface a strata of clean ore about two feet thick came on the hanging side and at 90 feet an underlay was started at an angle of sixty degrees to the north. It is the intention to follow this showing of ore and see what it leads to. The shaft is dry.—[Iron Spirit.

At the Anvil mine a new shaft was begun a short time ago. But 25 feet had been sunk when they struck a good quality of ore which has been penetrated over 20 feet. The finding of this ore so near the surface was considerable of a surprise, as it was supposed that it would be necessary to sink about 100 feet further before reaching the ore body.—[Iron Spirit.

MENOMINEE RANGE.

Work is favorably and satisfactorily progressing at the Fisk, west of the Commonwealth, and the promising young mine bids fair to enter the list of shippers during the later part of the season. The shaft is down thirty feet, the last ten feet of which is in almost perfectly clean ore, twenty-five or thirty tons of which now forms the nucleus of a future formidable stock pile. Supt. H. G. Fisk, one of the owners and in whose honor the mine has been named, intends to sink to a depth of sixty feet and then cross-cut north and south across the vein and drift east and west. Test-pitting shows the ore deposit on this valuable property to be 110 feet wide near the surface, and it has been opened up to a length of 225 feet. The ore, unlike that of most explorations, does not lie flat, but, on the contrary, stands up in massive layers, which indicates great depth. The metal now being taken out of the Fisk is a dark red, hard hematite, most of it assaying considerably over 60 per cent. in metallic iron, and, for non-Bessemer ore, comparatively low in phosphorus.—[Mining News.

The exploration which Messrs. Tully, Peterson, Mullinder, Coleman and Hillyer, of this city, are conducting on sec. 19, 40-18, this county, looks very promising. A third pit is going down 150 feet south of the first one that was dug, and is already bottomed in nearly clean ore at a depth of about twelve or fourteen feet. The gentlemen are sanguine of shortly finding a good body of ore on this property.—[Mining News.

Considerable ore has been encountered in the 50-foot shaft at the Mammoth exploration, lot 6, south of the Mansfield in 43 31, Michigan, and a cross-cut from the shaft east toward the river penetrated ten feet of good ore.—[Mining News.

Southern Iron Mining Notes:—

From the last issue of the *Iron Age* the following interesting items concerning iron discoveries in the South are taken:

A deposit of iron ore has been found near Tampa, Fla.

Deposits of iron ore have been discovered near Arredona, Fla.

Iron mines near Murphy, N. C., belonging to Maultby D Warwick, are to be reopened shortly.

E. S. Wassell, representing New Orleans capital, has bought 400 acres of iron ore property near New Birmingham, Tex.

Valuable iron ore deposits have been discovered on the farm of M. U. Edwards, in Stewart County, Ga. The ore was found four feet beneath the surface, and the vein is of great width and of remarkable richness.

What has been regarded by expert mining engineers as an important deposit of manganese has been opened at Jacksonville, Ala. Of the two large deposits found one assayed 69 per cent. and the other 42 per cent. of metallic manganese. There is a solid face of this mineral 15 feet thick. It is stated that there is a strong likelihood of a company being formed to establish a ferromanganese plant to utilize this mineral.

A Pennsylvania syndicate have paid $37,000 for Doe Mountain, in East Tennessee, not far from the North Carolina line. This mountain is said to contain a large deposit of iron ore, which has never known the miner's pick. There is no railroad within 28 miles, but as over $200,000 are said to have been invested in mineral lands in that locality by capitalists from the North, it is reasonable to infer that it will not be long before important developments will take place.

Iron in Missouri:—

In a recent report the State Geologist of Missouri says: In Crawford County iron ore still occupies a prominent place among its mineral products. Some of the deposits of ore are however, exhausted and others are approaching that condition. The demand will, before very long, be urgent for new sources of supply. The conditions are such, in this and adjoining counties, as to justify the expectation that systematic and thorough geologic work may lead to the discovery of other deposits, and it is the intention to institute such work as soon as the means and the demands upon the force of the survey will permit.

Lake Superior Shipments of Iron Ore:—

Lake shipments of iron ore from the mines of Lake Superior, for the season of 1890, up to Wednesday, June 11th, are as shown by the appended statement, condensed from the Marquette *Mining Journal*:

MARQUETTE RANGE.

American	202	Humboldt	3,681	Pitts. & L. Angeline	65,714
Barnum	2,118	Imperial	3,8?9	Prince of Wales	4,333
Buffalo	21,149	Jackson	24,920	Prout	3,639
Cambria	21,723	Lake Superior	73,474	Queen	21,608
Champion	56,417	Lillie	10,607	Republic	52,?16
Cleveland	59,603	Lucy	12,998	Salisbury	21,183
Cliffs Shaft	39,146	Marquette Ore Co	1 047	South Buffalo	21,008
Detroit	586	Michigamme	16,264	Volunteer	29,624
Dexter	630	Milwaukee	9,965	Winthrop	29,247
East New York	8,645	Negaunee	17,811		
Grand Rapids	1 699	New York	1,944		
Total, Marquette Range					636,260

MENOMINEE RANGE.

Aragon	4,564	Half and Half	383	Paint River	11,789
Armenia	9,455	Hamilton	6,045	Perkins	2,059
Chapin	174,287	Iron River	32,148	Pewabic	7,379
Commonwealth	27,564	Ludington	20,626	Shafer	15,128
Cyclops	17,314	Mastodon	19,620	Sheridan	467
Dunn	34,5?5	Millie	9,661	Vulcan	33,626
Florence	38,221	Monitor	1 087	Youngstown	8,731
Great Western	21,754	Norway	12,584		
Total, Menominee Range					509,047

GOGEBIC RANGE.

Albany	6,438	Federal	1,638	Pewabic	3,284
Anvil	11,303	Germania	9,926	Ruby	993
Ashland	110,270	Iron Belt	24,735	Section 33	20,996
Aurora	66,604	Montreal	5,265	Superior	4,085
Brotherton	10,369	Mt. Hope	16,930	Trezona	11,939
Cary	17,554	Norrie	192,771	Windsor	8,290
Colby	59 207	Pabst	25 417		
Father Hennepin	2,576	Palms	8,447		
Total, Gogebic Range					619,038

VERMILION RANGE.

Minnesota Iron Co	114,949	Chandler	98,278
Total, Vermilion Range			183,227
Grand Totals			2,047,572
To corresponding date of 1889			1,547,627

The Largest Casting Made in Australia.

Recently a party of gentlemen interested in mining affairs, including Messrs. Kelley and McBride, Directors, and Mr. W. R. Knox, Secretary, of the Broken Hill Proprietary Co., paid a visit to Messrs. G. E. Fulton & Co.'s foundry at Kilkenny, for the purpose of seeing a 12-ton fly-wheel cast. This is the largest casting that has yet been made in South Australia, and the fly-wheel is one of a pair now in course of construction, together with two pairs of engines for the Broken Hill Co. The fly-wheel when cast will weigh 12 tons, but when finished its weight will be reduced to 11 tons. It is 12 feet in diameter, with a 26-inch face, whilst the engines will be 300 H. P., indicated. The cylinders will be 16½ and 26 inches in diameter, respectively, with a 4 foot stroke, and having a piston speed of 450 feet per minute. They are similar in design to those made by the firm last year for the Proprietary Co., with a few slight alterations and improvements. The casting having been moulded in sand, three huge ladles, two containing 6 tons and the other 2 tons 10 cwt. of molten iron were raised upon traveling trains and run into the moulds by means of sand shoots. Vents were left in order to allow the air bubbles to escape, and the men, armed with long rods, continually stir it so as to provide against any air remaining, and thus causing flaws. The whole of the work was carried on without a hitch, and the mass will be allowed to remain till sufficiently cooled down to permit of being handled. The cost of the engines will be £2,500 a pair, and the work will be completed within about three months from the time of signing the contract.—[Australian Chronicle.

Annealing Iron.

At the usual monthly meeting of the Liverpool Polytechnic Society, Mr. T. Morris, F. G. S., of Warrington, read a very intetesting paper on "The Effects of Annealing on Iron after being in Use and on Sheets." Having explained the system called "close annealing," Mr. Morris contended that annealing was of no use to chains distressed with wear, unless the iron of which the chain was originally made was of good quality. In this case it was of great service, and should be employed when there was any doubt as to the existing strength of old chains. This point afterwards gave rise to considerable discussion, and a cordial vote of thanks to Mr. Morris, for his paper, brought the proceedings to a close.—[Iron & Steel Trades Journal, London.

IT may interest the readers of *Outing* to learn that the July number of *Outing* will appear greatly enlarged, carrying many improvements in this already popular magazine. Besides 16 additional pages of reading matter, it will contain 86 handsome illustrations making it, with its many full-page engravings, one of the finest publications ever sent from an American press.

KNOWLEDGE VS. THEORY.

It is common practice with a certain class of writers to denounce representatives of established domestic industries for occasionally appearing before Congressional Committees when legislation affecting their interests is under discussion. However wide the man's experience, however long and unsullied his business life, for him to make protest against legislation inimical to any great industry is to call down upon himself the sneers and abuse of men as innocent of a knowledge of the influence of legislation upon a country's industries as they are ignorant of the details of those industries.

This wing of the free trade army might find it profitable to recall the admission of that good free trade authority, Prof. Sidgwick, of England, in laying down the proposition that "no mere theorist has the right to dispute the practical business man of affairs on the effect of a law enacted by a nation on the industry and labor of the country in question, unless the said theorist has an equal array of facts and statistics to sustain his position." Admitting the correctness of this view, but one conclusion is possible, when the fact is recalled that clouds of witnesses in behalf of Protection have been forthcoming for a hundred years, backed up by figures from their business and facts within their expeaience—and that these are disputed almost exclusively by men who have neither their own experience nor that of practical producers to support their theories.

The history of manufactures the world over shows that not supremacy alone, but the bare independence of nations in the support of their peoples, so far as manufactures are concerned, has disappeared in the face of free trade with more favorably circumstanced and richer rivals. Ireland, Portugal and Turkey furnish European examples of industrial decadence resulting from diplomacy that gave to British manufacturers the opportunity to break down weaker competitors; while in far-off India, where cotton spinning and weaving once flourished and gave employment to thousands of contented natives, British guns compelled concessions to a free trade that proved the prelude to disappearance of a prosperous textile industry.

There is no more philanthropy behind present efforts of British tradesmen and diplomats to get control of American markets than inspired them to secure a monopoly of the trade in the countries named; and if the result should prove equally disastrous to American industries, Great Britain would have removed the most formidable obstacle to her ambition to become the workshop of the world.—[Illinois Branch American Protective Tariff League.

The Sand Blast In Metallic Manufacture.

Tilghman's sand blast process is now being applied with great success to the cleaning of iron and steel plates, brass, iron and steel castings, forgings, etc., for purposes where a particularly clean surface is required, free from scales, sand, etc., such as for turning, tooling, galvanizing, plating, painting, etc. The slightly roughened surface left by the sand blast causes the tin, zinc, plating materials, paint, etc., to adhere to it with greater force than when pressed by other methods. Hidden surfaces in cored castings can be cleaned by the rebounding of the grains of sand. The blast operates with equal facility upon flat, angular, curved and other irregular surfaces. It is proposed to apply the process to the cleaning and roughening of ship's plates previous to painting, etc. The system of blast employed is that in which steam is used to give the required velocity to the sand; but before the stream of mingled steam and sand has reached the object under operation it is met by a counter-current of air which sweeps aside the steam, and allows the sand alone to pass on, so that nothing but cool, dry sand strikes the object. The steam being thus carried away by a side outlet, connected by means of a flexible tube with an exhausting apparatus, the workman is enabled to readily watch the progress of the operation, and to direct the blast at the proper angle against all parts of the surface. The spent sand falls upon the floor, and is collected, from time to time, for use again. The apparatus requires from five to six horse-power of steam at 50 to 60 lbs. pressure per sq. inch. The manufacturers of the apparatus are Tilghman's Patent Sand Blast Co., Sheffield, Eng.

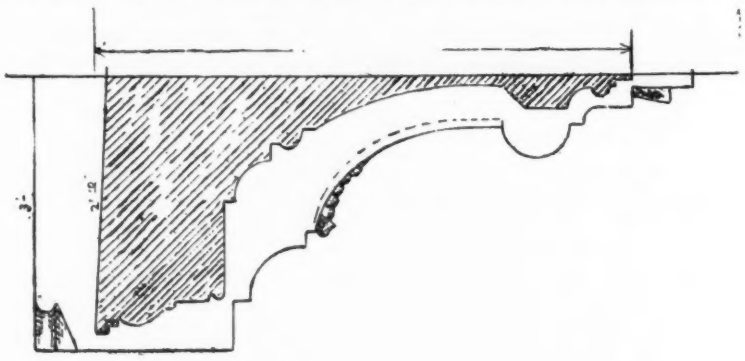
Another Aluminum Method.

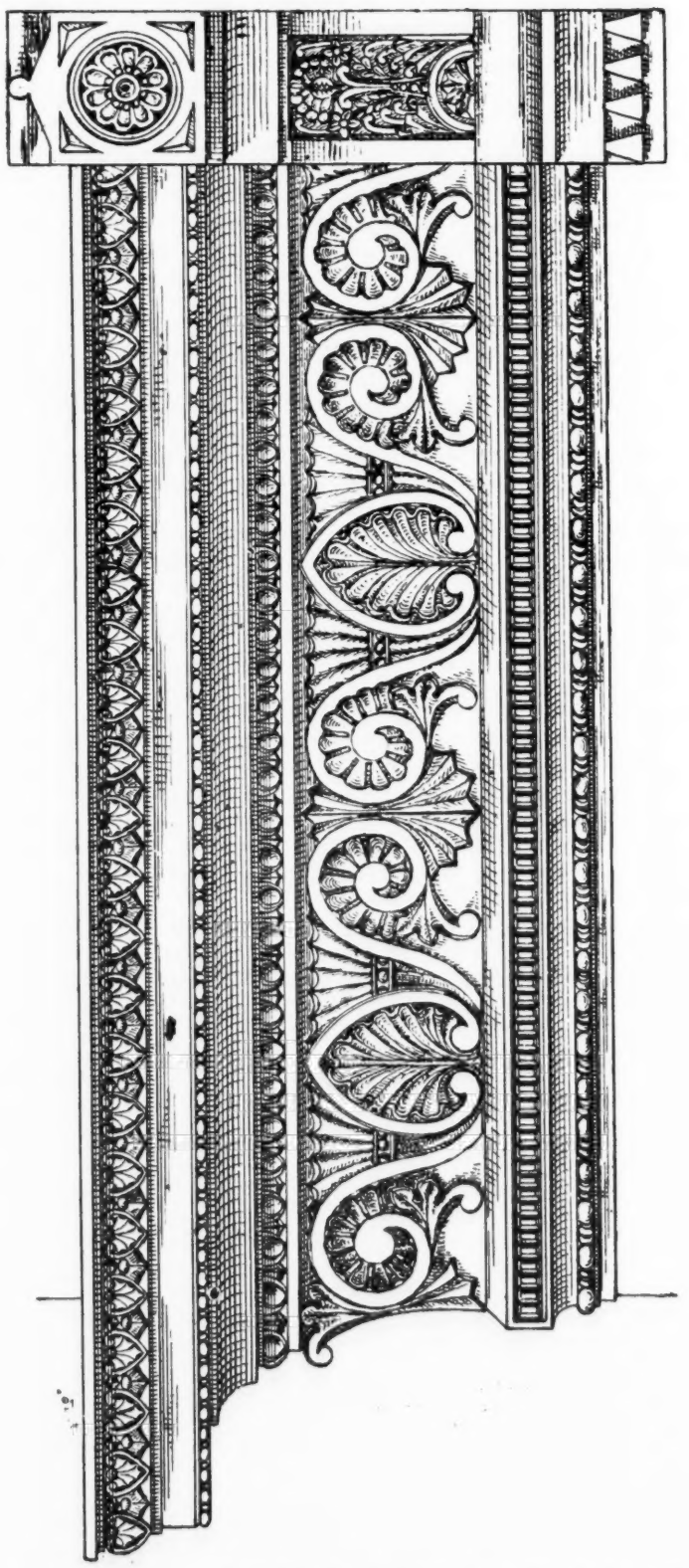
Prof. M. Emme, formerly in the employ of the Russian Government, has been carrying on a series of experiments for several years. Since his arrival here he has been assisted by Mr. W. B. Polk in the mechanical part. They have now a patent on an improved principle, entirely different from any previous method, for manufacturing alumina metal. The principle is known as electrolosis, using boxite, which is found in great quantities in Georgia and North Carolina. They claim to turn out alumina at less than one-half the price of any firm now manufacturing it. Their system does not require a high voltage of electricity and is much safer than former methods. Prof. Amme has a walking cane of pure alumina, which was made at his laboratory. S. W. Goode has been North to investigate prices and the demand for the metal, and is now organizing a company with $300,000 capital to erect a plant for making alumina. Your correspondent has devoted some time to the study of alumina, and is familiar with the present systems, costs and uses of the metal, and is satisfied they can place it on the market at $1 per pound, and at this price it is cheaper than brass, as it only weighs one-third as much.—[The Tradesman.

LAWN TENNIS has hitherto been the only leading sport not represented by a publication devoted exclusively to its interests. But at a recent meeting of the United States National Lawn Tennis Association, the publishers of *Outing*—the illustrated magazine of out-door sport and recreation—were authorized to publish a weekly supplement devoted exclusively to lawn tennis, and to officially represent the association. The initial number is at hand. It is called *Outing Weekly Tennis Record*, and is a handsome affair typographically, its 16 pages being patterned after the shape and size of *Outing*, to which it may be bound with perfect ease.

NEW DESIGNS FOR METAL CORNICE WORK.

Some very handsome designs for metal cornice work are herewith presented, as they will appear in the forthcoming catalogue of W. H. Mullins, Salem, O., manufacturer of architectural sheet metal work. They will be recognized as being a departure from the old styles of galvanized iron cornice work, which have been in use for years, and which were, in reality, nothing but an imitation of the old designs of wood, stone and brick cornices in use





for ages, not in any way adapted to sheet metal work. The designs of cornice work shown are principally mouldings, with ornamental enrichments and stamped metal scrolls and garlands shown on the frieze. It will be noticed that the designers have done away with the old style brackets or incized work made up of cut and soldered galvanized iron. In his designs of sheet metal

building fronts Mr. Mullins also aimed at a style entirely applicable to sheet metal, breaking up all plain surfaces as much as possible into small panels and ornamenting with stamped metal work. These designs, besides being ornamental, are very durable and cheap, and make the most effective building front that can be had within a reasonable limit of cost. They can be used for repairing old buildings by covering the old brick walls with them, and by using them, old and dilapitated buildings can be made to appear modern for a very trifle cost. The manufacturer is furnishing several fronts of this kind for use on old buildings, and they are giving the greatest satisfaction. Where used on new buildings it is only necessary to build up a wooden frame work back of them, covering this with the iron, which makes a very cheap, and at the same time substantial construction.

OHIO'S IRON ROOFING INDUSTRY.

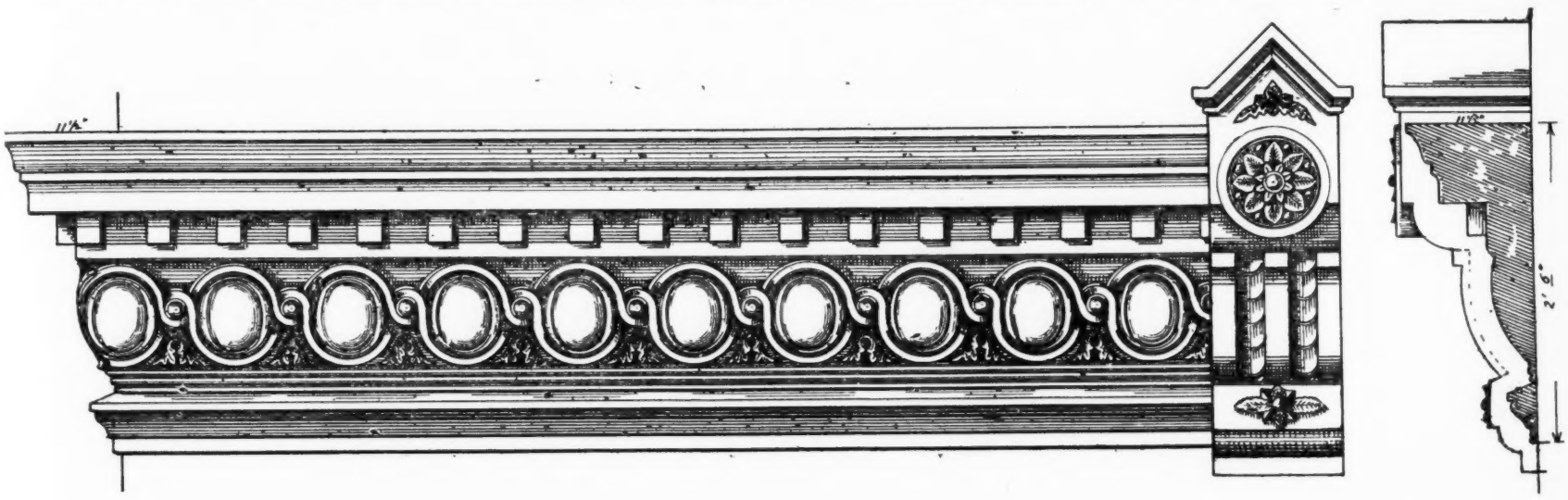
From the Cincinnati *Times-Star* we take the following interesting article

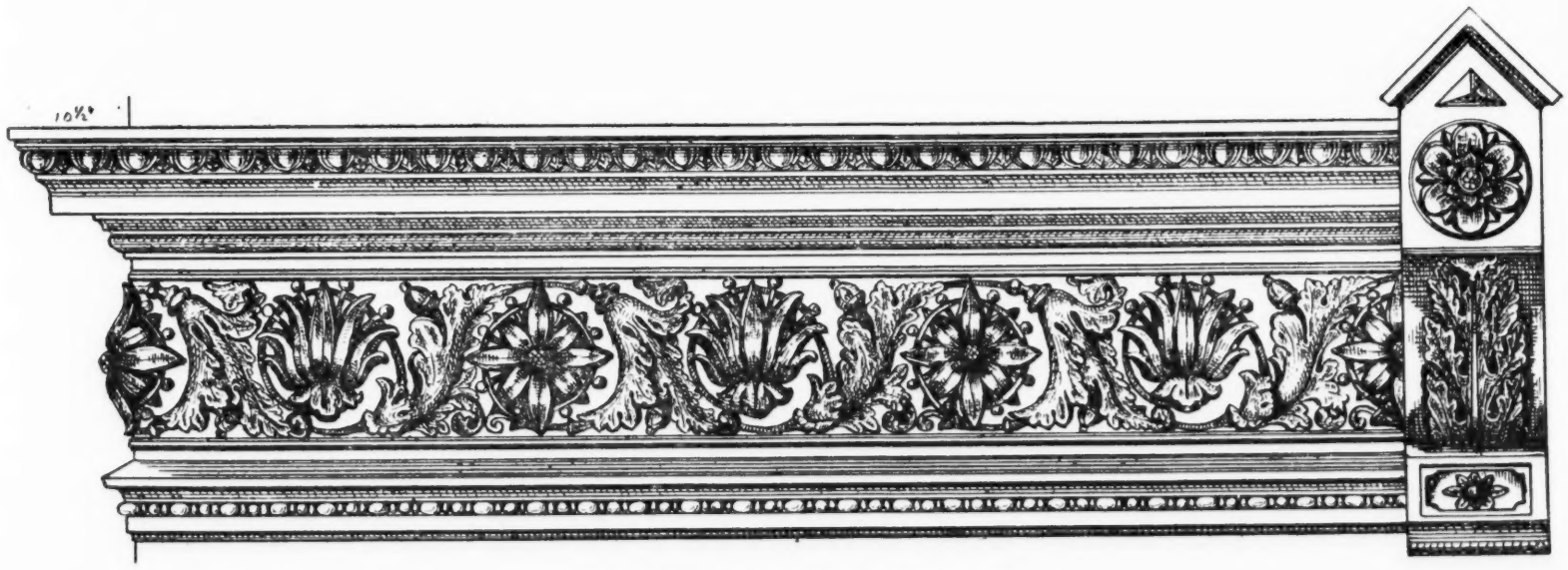
The patter of the raindrops on the shingles still continues to a great extent, but modern houses, and especially manufactories, offer something less poetical for the glittering drops to encounter. Slate roo's are very pretty,, but the dropping of the rain is deadened on them, while iron roofs turn the musical tinkle into a roar. Modern ingenuity has entirely changed the character of a rainy day, for modern rain, instead of furnishing inspiration to poets and losing itself in the cracks of soggy shingles, drops with a dull and unromantic thump, and rushes off to fill the cisterns in a strictly matter-of-fact sort of a way.

This great change has been brought about by the introduction of iron roofing. This roofing is ordinary sheet iron, rolled and cut into various shapes. The simplest manner of applying it is in flat sheets, about 2½ feet wide and 8 feet long. These sheets have about an inch along the sides bent, so as to stand perpendicular to the surface of the sheet. The roof is prepared as for shingles, and the sheets are laid side by side upon the boards, when a cap or long strip of the same material, bent double longitudinally, is slipped over the standing edges, and secured by cleats of sheet iron. This forms what is known as the standing seam, and is employed in most roofing with slight modifications.

Then there is the corrugated roof, which is corrugated longitudinally, and in which the corrugation on the edge of one sheet fits snugly upon that on the edge of the next sheet, and the two are riveted together. Iron shingles are another fad. They are made in an endless variety of shapes, and some are applied like ordinary wood shingles, while others fit together like the pieces of a puzzle block and form one rigid whole. But this is not the only use to which the material is put. Several large factories and freight depots of Cincinnati are weatherboarded with it. For this purpose it is pressed so as to resemble a brick wall, a weatherboarded wall, or is used in the corrugated form. A house may be built of ordinary rough lumber, and covered with this siding, and presto, change! there is a beautiful brick house. Some of the dainty brick houses of Cincinnati are decidedly wooden beneath the surface. They are as good as brick, however, as they are fireproof. There is one objection to this, however, in the heat the iron radiates if exposed to the direct rays of the sun, but if the house be shaded this siding is very desirable. These roofs and sidings should be painted frequently, so that the action of the water may not corrode them. Without paint they last but a short time, but by proper care one may be made to last 50 or more years. Instances of old roofs are that of the Good Samaritan Hospital, which has repelled the storms of 30 Winters, and still looks youthful; an iron roof was removed from the Cathedral parsonage on Eighth street, several years ago, which had been on for 50 years, and many roofs are known in several places which have served from 25 to 50 years.

Ohio makes more of this roofing than any other State or country in the world, and it is a peculiar fact that Pennsylvania, which produces so much iron, is the best market. There is very little made, but a great deal of it used in the East. The principal factories are at Cincinnati, Canton, Cleveland, Wheeling, Pittsburgh, and a few at Philadelphia, Chicago and St. Louis. The South was a splendid market, but they are beginning to make a little of it there, still they can by no means supply the demand. Cincinnati's output annually is over 13,000 tons, or 375 000 squares. That is sufficient to cover 15,000 large houses annually, and is more than is made by any other city in the world. Very heavy machines are necessary to press the sheets into the required form, and these are made mostly in Cincinnati also. These machines usually cost about $6,000 each. They are simply gigantic presses worked by steam.





NEW DESIGNS FOR METAL CORNICE WORK.

How Was It in 1861?

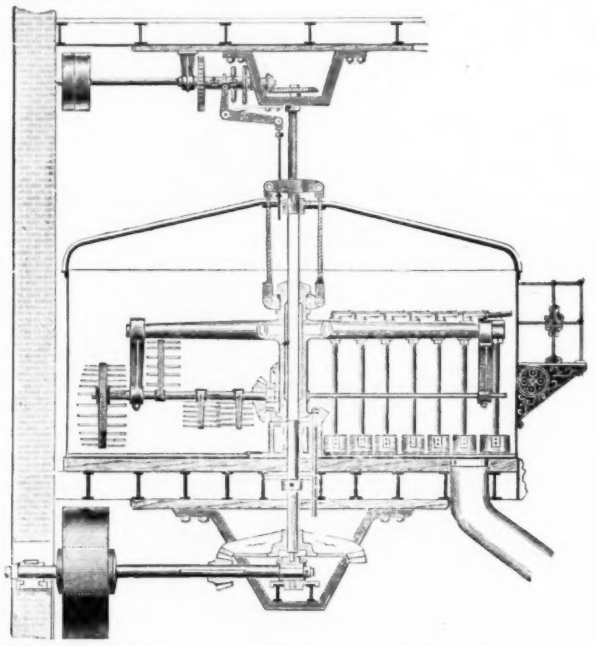
The Iron Trade Review, at the close of a reference to a point made by a Representative in the recent tariff debate in the House, asks a question which is in itself a whole volume of comment, in its significance and force of suggestive argument. We quote: "No truer thing was said in the recent tariff debate than this, by Congressman Atkinson, of West Virginia: 'If all the ports of entry on both oceans were to-day blockaded so that no vessel could enter them bearing the product of other countries, and war should be declared against us,' he said, 'we could, with our present facilities, produce every munition of war, and every article we might need for our sustenance a thousand years.' How was it in 1861, and what has wrought the change?"—[Industrial World, Chicago.

THE current number of the *Archiv fur Eisenbahnwesen* contains it annual summary of the world's railroad mileage, bringing the figures down to the beginning of 1889. The total railroad mileage of the world was then 357,400 miles, of which the Continent of America possessed 190,000 miles, or more than one-half of all. The general results as compared with four years before show an increase of 64,000 miles, of which 40,000 are in America and 30,000 in the United States alone.

AN IMPROVED MASH MACHINE.

Since the mode of removing grains from the mash-tub by the machine, there has been a great deal of experimenting to make machines which will answer both purposes (mashing and removing grains) to satisfaction. None of the different devices constructed yet have, it is claimed, answered both purposes. It is asserted that it is an impossibility to make a machine strong enough which, under all circumstances, will move at once (in the tub) a solid body of grains—400 to 500 bushels. There is claimed to be only one way to make a perfect mash and grain-removing machine, that is the one with automatic raising and lowering device. The patented improved mash machine, herewith illustrated with the above device, will remove from 400 to 500 bushels of grains in thirty-five to forty-five minutes.

In combination of a perfect mash machine, the grain-removing device is with an automatic raising and lowering stopper. The upright shaft does not move while the machine is raised out of grains, but the machine is sliding on the square part of said shaft. The machine may be raised or lowered without running the upright shaft. Before removing the grains, the machine will be raised and will stop automatically at the point desired. After opening the



grain-discharge valve, the machine will be started from the top (same as during mashing, when machine is down), and the grains will first be taken from the top, which will be moved by the position of the shovels to the funnel-opening made by the discharge valve. The machine runs down automatically, moving at every revolution only the upper part of the grains, until the same is removed from the mash-tub, when the machine will stop automatically. It will clearly be seen that this device for removing the grains gives no strain on the machine whatever, and there is no danger of breaking down. Manufactured by Krieger, Burkhardt & Co., Cincinnati, O.

THE MANCHESTER SHIP CANAL.

The Liverpool and Manchester ship canal will, it is expected, be completed in less than two years. During three successive sessions Manchester persisted in asking the British Parliament to sanction such a scheme, but the railway interest, which is always a strong element in the House of Commons, was successful in its opposition; and it was not until the year 1886 that the bill was passed authorizing the construction of the work. For the last 35 years the trades of Lancashire have been subjected to heavy taxation. The Liverpool dock dues were very high; excessive rates were charged by railroad companies, and there existed a whole class of middlemen, called cotton brokers, without whose intervention, both on the side of the buyers and sellers, cotton could not change hands. It began at last to be thrust upon the traders with the force of conviction that if they desired to continue to compete in foreign markets with foreign and colonial producers they must get their goods to market at a cheaper rate; and so the movement began which promises to create such a revolution in carrying charges, and thus to economize the total cost of production.

The difficulties attending the construction of the canal were of great magnitude. Railroads had to be elevated so as to carry the tracks over the canal at a height of 75 feet above the water level. A deep water channel had to be constructed in the Upper Mersey by means of half tide training walls, the channel being ten miles long and 300 feet wide at its upper end, and 1,000 feet wide at its lower end. At one place the canal passes under the old Bridgewater Canal; at another, the Liverpool water works aqueduct passes under it. A total rise of 60 feet had to be given the canal between its entracce and the dock level at Manchester. The largest of the locks is 600 feet by 80 feet, and the smallest 150 feet by 30 feet. Five miles of solid wall with dock frontage were built at Manchester, and the amount of pile-driving needed to form the embankments was of itself stupendous.

The elemental warfare against the work has also been severe. Communication was often interrupted by the inundation of traffic lines, and by a breach in the bank during heavy rains 65,000,000 gallons of water entered a cutting—weeks having been required to undo what had happened in twenty minutes. A total of 12,000 men and boys have been constantly employed; and when the steam locomotion, the pumping and other varieties of work are added to those of excavation, the amount of horse-power exerted daily has been calculated to represent the manual labor of 120,000 men, in addition to the number actually employed.

The promoters estimate that the canal and dock can be maintained for 15 per cent. of the gross receipts, and that by its construction the producers and consumers of the Manchester district will save one-half of the present transit charges. The coasting trade is also likely to find its way to the canal, and there is a considerable trade possible from English coasts to Manchester for trans-shipment to foreign countries. The greatest attractions a port could offer to ships to come to it, is the probability of rapid dispatch and a return cargo. The Manchester corporation is preparing for a vast extension of the import cattle market, the people of the district having voluntarily taxed themselves to promote the work; and all indications point to an increase of general local prosperity, as well as to advantages to commerce throughout the whole world.—[Philadelphia Record.

SHIP-BUILDING IN SCOTLAND.

The past month has not led to any improvement in the Scotch ship-building trade. New orders continue scarce, notwithstanding a more active inquiry, and a considerable fall in contract prices has failed to bring forward any work of importance. The revival in the freight market, which was so confidently expected in the latter part of the Spring, seems as far off as ever, and until this depression passes off, ship-owners are not likely to increase their tonnage. Our own columns bear witness every week to the rapid manner in which ship-building firms are completing the orders on their books, and the time cannot be far distant now, when the bulk of the contracts made during the recent revival will have been all worked off. It is much to be regretted that the drop in contract rates has not resulted in the placing of fresh orders by ship-owners, but the explanation is doubtless to be found in the serious decline in freights, which, in some instances, at least, are lower now than they have been for many years. In the other ship-building centres, the paucity of new orders is causing some anxiety, and though work is still plentiful the present activity must soon come to an end unless the ship-owners meanwhile come to the rescue. Much, therefore, depends on the turn of events in the freight market, though here the outlook is far from promising.

During the past month thirty vessels have left the Scotch yards, representing 30,480 tons, of which the Clyde contributes 26,430; Dundee, 2,730; Kinghorn, 1,000; and Leith, a single steamer. This is a decline of over 17,000 tons on the preceding month, though an improvement on the month of March of about 4,000 tons. For the five months of the year the total as regards the Clyde is 149,650 tons of new shipping as compared with 115,200 tons in the corresponding period last year. We have to go back to 1883, one of the "years of plenty," for a parallel to the present year, which falls several thousand tons below the same period of 1883. The contracts entered into during the past month only amount to about 3,000 tons, and it is now computed that the work on hand on the Clyde is reduced to 175,000 tons, as compared with 300,000 tons at the beginning of the year, and 256,000 tons at the same period of 1889. The returns also show that at Aberdeen and Grangemouth and Alloa not a single ton of shipping was produced last month. At the moment the most important contracts in the markets are for the construction of several sets of twin-screw triple-expansion engines for second-class cruisers now building in the Royal Dockyards, and it is likely that one or two of these will find their way to Scotland. Beyond this the outlook in Scotch ship-building trade is decidedly unsatisfactory, and all the evidence at our disposal seems to indicate that the prospect is not one whit better at any of the great centres of ship-building south of the Tweed.—[Iron and Coal Trades Review.

A Hint to Stove and Furnace Makers.

For some years past American stoves and furnaces have enjoyed a wide popularity on the continent of Europe. Their graceful construction, effectiveness as fuel economizers and low cost have specially captured the thrifty German people. American-made stoves, certainly superior to the English and Irish-made stoves, have undersold them in the German markets, mainly because of the superior facilities and contrivances adopted in manufacture in this country. But the German objects to importing what he can make himself. Stove factories are therefore springing up all over, and more especially in the vicinity of Mannheim, where so-called "American stoves" are being turned out rapidly. The result of this has already appreciably affected the exportation of American stoves to Germany. And it may be depended upon that, as soon as the Germans perfect their mechanism and methods, and with cheap labor, they will become formidable competitors in our outside markets. In all the republics of South America, more especially, the Germans are now pushing their products, and in some cases they are even crowding the English. As our Teuton competitors waste little time in commercial matters, it behooves American stove manufacturers to watch their South American markets. Eternal vigilance and goaheaditiveness are the price of commercial supremacy.—[Engineering & Mining Journal.

A Large Mould.

The largest ingot mould ever produced in Sheffield has been completed for a local company by Messrs. Moorwood, Sons & Co., Hurleston Ironworks, Carlisle street, East. It is 14 feet high by 5 feet 6 in. square, and weighs about 40 tons. Many of the leading manufacturers have been to see this immense mould, which is intended for casting Bessemer steel ingots for huge marine work.—[Glasgow Engineer.

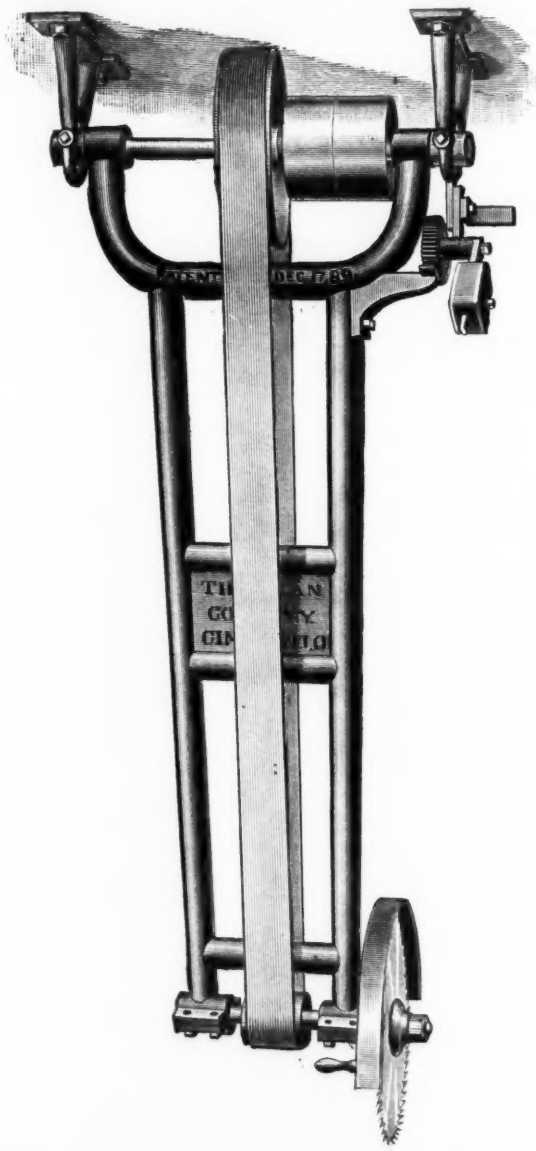
A COMMERCIAL exhibition on a large scale is projected in Moscow, of Russian manufactures, etc. The exposition will contain specimens of the vegetable and mineral kingdoms of Central Asia in the raw state, and manufactured.

NEW PATENT SWING CUTTING-OFF SAW.

There is nothing so handy and nothing in the machine line around a pattern shop or packing room that is so important as the swing cut-off saw. Any improvements in it are of interest to the operator, and to the mechanic The one we show on this page is something new and original, just brought out by the now well-known firm mentioned below, whose productions command such high appreciation in this country and abroad.

This new style swing cut-off saw possesses many points of excellence which the builders feel assured will be appreciated by the trade. The No. 1 wrought iron frame is a light yet thoroughly braced machine, and can be made almost any desired length to suit height of ceiling. The No. 2 cast frame machine is made a standard size, suitable for the average heights of ceilings, and is especially suitable for cutting off extra wide and heavy stock.

The patent adjustable self-acting, compensating or balance weight, and the way it is attached and operates, gives the machine great advantage for quick



work, as it helps the operator both ways, and when the cut is finished the counter-balance swings the saw back clear of the lumber without any effort on the part of the operator.

The hangers are very perfect. The frame swings on the outside of turned sleeve boxes, and the countershaft runs inside of these boxes, making it very perfect and reliable, and impossible to get out of line, as the frame does not hang or swing on the countershaft, but on the boxes of the hangers. The mandrel is of steel, and has an extra large pulley, and self-oiling boxes lined with babbitt metal. The patent shield, covering the saw, in connection with the balance weight, prevents any possible accident to the operator.

The builders call special attention to the strong and durable manner in which the machines are constructed. The designs show light yet thoroughly braced frames, which are not likely to get out of line with any ordinary usage. Pattern shops, packing rooms, and all wood-workers wanting a cut-off saw for quick and accurate work, will find these machines far superior to the old style machines. For further information address the manufacturers, The Egan Co., Nos. 251 to 271 West Front street, Cincinnati, O.

THE FICKLENESS OF STEEL.

Concerning this fickle metal but little is known which is positive. The testimony of various workers in the trades shows that their experience is dissimilar; and despite the years it has been used in the arts, steel is capricious and uncertain in its behavior. At one of the meetings of the American Society of Mechanical Engineers, some of the members gave their views in certain directions, and a portion of their remarks is given below. A member said:

"An important matter is the re-working of steel for small tools, such as dies, taps and reamers. These tools are of a great variety, and up to a dozen or twenty years ago, it was a custom almost universal to hand-forge blanks to approximately their final size. These were then finished up and hardened, and I suppose that more various results could scarcely be obtained than were obtained. After a time it began to dawn on some of the master mechanics of these establishments that working steel in a small way was a failure; and I well remember the time when one of them gave out the order that thereafter no tools should be forged; that they should be cut from the solid bar. The result was an immediate and very great improvement, and I believe they have never gone back to the old method. The former practice had been so various that very naturally all sorts of theories were afloat as to just how steel should be heated, and just how it should be cooled. The theories were, indeed, almost as various as the steel workers themselves. At the present time I believe the practice has become substantially uniform. One tool-maker of the olden time would argue that steel would swell by being hardened. Another would argue that it would skrink, and so on. Men working side by side would maintain opposite theories. Much more in this line might be said, but the only point I wish to make is this: that steel suitable to be used for small tools is not improved by working after it is made. Its true and proper character is given to it in its making, and follows it through life. It is reported by several competent tool-makers that the preferable method of making steel tools requiring accurate form is first to shape the piece approximately, then thoroughly to harden the same, next and immediately to anneal it carefully and slowly, and finally to re-shape the piece and harden and temper in the ordinary way. The first hardening is claimed to induce those internal strains and warping due to the cooling of a piece of the particular shape, which strains are at once relieved by the immediate re-annealing of the piece. The re-shaping, by reducing the entire surface of the article, removes the numerous incipient fire cracks which are inevitably formed, thereby greatly lessening the danger of cracking at the final hardening.

"My experience with bushings that we introduce in our engines, and hardened steel stems, is that we do not heat them to a point where they would scale, but take considerable care in the heating of them. Being slow about it, and keeping the temperature down below the scaling point, we do not find any enlargement. Our fits are made reasonably close to run, and usually the stem can be pushed into the hole—they are some 9 in. or 10 in. long—and then it is relieved by straightening up in the process of grinding—of course the larger and longer the more care. In the steamer Nashua we have stems some 9 ft. long and 2½ in. in diameter. He came back and said that no more should come into any work of his. After one or two trials I took the matter in hand and rigged up a barrel of ice water, leaving part of the head in the barrel—I will explain that the steel was about 2 ft. from the end where it had been hardened; with a space about 18 in. long at each end. I rigged up a guide to drop vertically, and heated the steel slowly and dropped it quickly into the water. It came out practically straight, copying the operation as used in straightening files while the steel was warm. Putting it on the centers, a shaft some 9 ft. long was practically straight and without any scale; ran very nicely; it occurs to me that the proper way to harden steel and keep it straight, especially bars that you wish to maintain in a parallel position, is to get the hot surface under solid water as quickly and as vertically as possible, so that the surface of the water will not influence the part that is to be hardened unevenly by ebullition. I do not think that the closing around of the chilling operation of the water can be too quick. The only improvement I suggest would be, if we could erect a cannon and shoot the steel like a ramrod into the water, we would have a straight piece after cooling."

The Chairman: "Did Mr. Wheelock move the steel in the water as in tempering, or let it be still? When you put this rod of steel down in the water, did you let it remain still in that way or keep stirring it around?"

Jerome Wheelock said: "No, sir, we let it be its own way, falling vertically into the water. The bottom of the barrel was supported by a flat rock, and we left it there until it was warm, being able to bear the hand on the surface—and then straightened it a little. The worst case of springing in the bearings that we had to deal with was less than one-thirty-second of an inch out of true. That was straightened by the operation. The place of hardening was true, but at the point of leaving the hard it was a little changed, due, I presume, to ebullition."

Mr. Geo. E. Whitehead said; "In my experience we get more trouble in hardening in the Winter than we do in Summer, and I am inclined to think that dipping in water too cool has the effect of breaking tools a great deal quicker than if the water was of a milder temperature. I have hardened a great many dies, and had quite a number crack. Most of the dies that cracked came from the softer or inferior grades of steel. Where we use the higher quality of tool steel we do not lose so many dies in tempering. I have had a good deal of experience such as has been mentioned by the different members. I have put soft steel shafts in presses where they would run six months and break, and replaced with wrought iron, and they have run three or four years before breaking. I have also taken threading dies that were too large and made them smaller by re-hardening, and I presume a great many mechanics have had similar experience."—[Engineering.

THE German Iron & Steel Trades' Association represent 60 iron ore works, 220 blast furnaces, steel works, etc., 47 black and tin-plate works, 232 iron foundries, 32 stud, nail, screw, etc., works, 136 engineering works, 21 wagon-building works, 17 ship-building yards, 1 telegraph construction works, 3 copper works, 36 collieries and coke works. These establishment employ about 244,000 hauds, and the capital embarked in them is estimated at 1,400,000,000 marks. The Association is divided into 8 groups, of which the largest is the North-west (Dusseldorf) and the smallest that of the ship-building yards (Berlin).

AN $8,000,000 ship canal is to be built by a French company, connecting Delaware and Chesapeake bay. It will be a valuable short-cut.

WATER GAS FOR STEEL MELTING.

American iron and steel makers will be interested in reading the subjoined article from the current issue of the London *Iron & Steel Trades Journal*, relative to the use of water gas in steel-making. While not in position to deny the statements regarding ths use of water gas for this purpose in the United States, we were not aware, until reading the article in question, that this fuel was in anything like the general use claimed for it in this country for the purpose named. However, the article possesses a certain value, and we herewith reproduce it in full, for what it is worth. The experiments in Great Britain will certainly be watched with interest. The article is as follows:

On Wednesday, last week, at the works of the Leeds Forge Co., at Armley, we witnessed a very interesting demonstration of the value of water gas for steel melting. Before referring to the work accomplished by the aid of this valuable fuel, a few remarks upon the use of water gas will be appropriate.

In no less than 285 towns and cities in the United States of America, water gas is used for illuminating purposes, and, apart from the economy effected as compared with coal gas, it is everywhere recognized that, on sanitary grounds, water gas is immensely superior to all others. In New York city alone it is estimated that one thousand million cubic feet of water gas are annually burnt. Some of the most eminent authorities in America, on the Continent, and in England, have unhesitatingly expressed themselves in favor of water gas for illuminating purposes, and though, in this country, but slow progress has been made towards its adoption, we are inclined to believe that it is the gas of the future. For lighting it is better, because it gives an absolutely steady, white light—soft to the eye, yet brilliant; does not in the least blacken ceilings or tarnish goods, and only consumes half the quantity of air that coal gas does for an equal light; whilst, finally, it is far cheaper than coal gas. These facts are fully corroborated by those who have used water gas, the chemical composition of which fully explains the satisfactory results it gives.

It is to water gas for heating purposes, and especially in metallurgical operations, that we desire to draw attention, believing that we are on the eve of a great era in its history. In Germany water gas is used at Essen, Hoerde, Furstenwalde, Gelnhausen and Warstein, at Winterthur in Switzerland, and also in Paris.

The water gas producing plant consists of a producer's and scrubber's boiler, gasometer and purifying house and the necessary vessels. The gas made is found to be exceedingly well adapted for use in the Siemens-Martin open-hearth. In a report on the working of the open-hearth, the engineer-in-charge states that "when using water gas it was found that the open-hearth could be worked at about one-half the cost of that when ordinary producer gas was used, and for equal heat evolved on combustion, the cost of water gas and of ordinary producer gas, stood in the relation of 1.77 to 1.72," and that "besides the saving effected when the furnace was worked with water gas, the furnace itself is of much simpler construction," and it was found, when using gas for welding purpose, that only 58 per cent. of the heat was required which was necessary when using ordinary fuel.

In the case of a large steel works where the output of steel per furnace had been 160 tons per week, the introduction of water gas raised the output to 240 tons per furnace, and a purer quality of steel is produced.

In the month of September, 1887, the exigencies of the metallurgical operations carried out at the Leeds Forge, demanded fuel of a higher calorific intensity than could be found in the generator gas of the Siemens producer, or in the ordinary coal gas used for illuminating purposes. The pressure supply of the latter being of a very varying nature, produced such an effect upon the flames as to completely prohibit its continued use. Mr. Samson Fox found, by actual readings, that the pressure of the coal gas in the town mains varied from $\frac{8}{100}$ to $\frac{30}{10}$ of an inch of water; and these variations in pressure, which were uncontrollable at the Leeds Forge Co.'s works, took place at irregular periods of the day and night, without warning, so that, from working in a satisfactory manner, suddenly the character of the flames was completely altered, and in many cases pieces of work were seriously damaged, if not actually spoiled. Mr. Fox thereupon determined to have a gas works of his own, to be so arranged that the most suitable pressure for the work to be done should be constantly maintained, and that the supply should be bountiful and of an uniform pressure.

A water gas plant was therefore decided upon by Mr. Fox, and instructions given for its immediate erection. The works were commenced on the 29th of March, 1888, the plant, capable of producing 35,000 cubic feet per hour, was started, and has been in constant operation since that date with perfect success, and with a product giving most ample satisfaction. No alteration has been necessary to the then existing plant, beyond connecting the gas pipes from the water gas works to the several furnaces and machines.

Mr. W. Lawrence Wildy, the engineer in charge of the Leeds Forge reported on November 30th, 1888, on the working of the water gas plant, as follows:

"The first gas was made on the 29th of March, 1888, so that the Water Gas Works have now been in operation eight months, and during that period we have had no accident, delay, or hitch of any sort, and we have produced 25,575,600 cubic feet of water gas, on a consumption of 752 tons of coke, being equal to 34,000 cubic feet of water gas to the ton of fuel. The quality of the gas is fully equal to the analysis stated by Herr Blass, the consulting engineer to the European Water Gas Co., viz:

Hydrogen	50 to 51 per cent.	
Carbonic oxide	44 to 45 per cent.	
Being equal to	95 per cent.	Combustible.

"The cost of the gas, including fuel, labor, steam and water, interest and depreciation at 15 per cent., and allowing for the value of the producer gas made in blowing the generators hot, is 3¼d. per 1,000 cubic feet at the burners. Since applying the gas to the various operations in which it is employed, the following economies have resulted:

1. A greatly increased speed of production, equal to over 100 per cent. more work in a given time, coupled with superior workmanship.
2. A reduction in the cost of gas of ..... 62 per cent.
3. " " " wages of ..... 50 " "
4. " " " gas and wages combined of ..... 58 " "

"Water gas has been connected with the offices and yard, which are now lighted by it alone; the gas stoves are run by it with much increased efficiency over coal gas, the cooking stoves and laundry are fed with the same gas with perfect satisfaction, and in the chemical laboratory water gas is much appreciated by the analysts on account of the superior quality of the flame, the intensity of heat attainable in the muffles, and the freedom from smell in its combustion, which, in coal gas in Bunsen burners, was a source of great unpleasantness. The absence of all black deposit on the breakers and dishes is a source of congratulation to the chemists. The plant will produce 48,000 cubic feet of water gas per hour, if required, or it may be worked for a few hours per day, or left for some days without any gas being made, and it is ready for producing at half-an-hour's notice. Each generator requires two men to attend it.

"The value of the producer gas made in blowing the generator hot—and which, on the score of expediency, we burn in our boiler furnaces—has proved to be very great, as, owing to its perfect combustion, and the easy regulation of the exact quantity of air necessary to consume it, the four furnaces to which it is applied are evaporating 50 per cent. more water than those fired with solid fuel, and the reduction in the quantity of coal for boiler firing amounts to 895 tons since the gas was applied; 70 per cent. only of the value of this amount of fuel is credited to the water gas producers. The experience thus gained impresses upon me the fact that further economies would result if all the boilers were supplied with gas, as they would require fewer stokers, the heat units in the fuel would be more efficiently employed, and the amount of flue cleaning would be reduced. It is needless to add that there would be no smoke issuing from the stack, the combustion of the gas being practically perfect."

Since this report of Mr. Wildy's, the plant at Leeds has been working so satisfactorily, that its capacity is being doubled, so that a sufficient supply may be available for melting the steel made at the Leeds Forge Co.'s works.

In a recent issue we published the names of some of the most prominent steel manufacturers of the North of England and Scotland, who witnessed a demonstration of what can be done in steel melting with water gas. The following statement of the actual charge, time occupied in melting and reducing it, and analysis, will commend itself strongly to practical men. Steel melting by water gas in 10 ton Siemens' ordinary open-hearth furnace, at Leeds Forge, on March 21st, 1890:

CHARGE 341.

Composition of Charge.	Tons.	Cwt.	Qrs.
Pig metal "A"	4	0	0
Pig metal "B"	1	8	0
Plate scrap	1	11	0
Rough scrap	2	1	0
Total	9	0	0
Hematite ore	1	14	0

TIME OCCUPIED IN MELTING AND REDUCING.

Charge commenced	at	10 15 A. M.
Do. finished	"	11.05 " and water gas turned on.
Bath level	"	12 20 P. M.
Bath molten	"	1.15 "
Half water gas shut off	"	2.03 "
Total water gas cut off	"	2 45 "
Finished ready to tap and tapped	"	4.09 "
Time occupied		5 hours, 4 minutes.

ANALYSES OF GASES.

	Producer Gas.	Mixed Gas.	Water Gas.
CO_2	6.2	6.0	6.20
O.	0 0	0.0	0 0
CO.	22.2	27.6	39 32
H.	10.63	27.9	50.53
CNH_2N. NCH_4 (by difference)	1 00	1.59	1.70
	60.57	36.91	2.97
	100.00	100 00	100.00

Amount of water gas used, 40.7 per cent.
Amount of producer gas used, 59.3 per cent.

ANALYSIS OF SAMPLES TAKEN FROM FURNACE.

Carbon—					
No. 1.	No. 2.	No. 3.	No. 4.	No 5.	No. 6.
1.35 P. M.	2 P. M.	2.30 P. M.	3 P. M.	3 30 P. M.	4 P. M.
2 per cent.	1.85 per cent.	1 6 per cent.	.73 per cent.	.4 per cent.	.09 per cent.
Silicon—					
No. 1.					No. 6.
.59 per cent.				1.	.0065 per cent.
				2.	trace

ANALYSIS OF SAMPLE TAKEN FROM INGOTS.

Carbon ..... .125 per cent.

"One ton of fuel used in the patent water gas generator gives 35,000 cubic feet of water gas and 140,000 cubic feet of producer gas, *i. e*, in the proportion of one to four, and dividing the ton for the purpose of the following calculations into that proportion we have 448 lbs. to 1.792 lbs. By measurements taken from the water gas holder, 82,000 cubic feet of water gas were used in the time occupied in melting and reducing from 11 05 A. M to 2 45 P. M; and according to the above proportion the amount of fuel which was required only for the production of that quantity of water gas was 1,049 lbs. of fuel. As 35,000 cubic feet : 448 :: 82,000 cubic feet to 1,049 lbs. Now as we use 40.7 per cent. of water gas, and 59.3 per cent. of producer gas for 3 hours 40 minutes, there were used 119,500 cubic feet of producer gas, requiring for its production 1,530 lbs. of fuel. As 140,000 cubic feet : 1,792 :: 119,500 cubic feet to 1,530 lbs. Producer gas only was used for 2 hours 15 minutes (charging time one hour included), at the rate of 71,500 cubic feet per hour, or in all 160,875 cubic feet of producer gas, requiring in the proportion named above 2,059 lbs. of fuel. The above quantities of fuel, viz, 1,049, 1,530 and 2,059 lbs., amounting in all to 4,638 lbs., divided into nine tons of metal cast from the furnace gives a fuel

consumption of 515 lbs. which equals 4 cwt. 2 qrs. 11 lbs. per ton of ingot produced."

The following are the particulars of the charge we saw melted last week, the times and other particulars were noted by ourselves and the representatives of several important works present. The work done in 4 hours and 49 minutes, would have occupied 11 hours in ordinary practice without the aid of water gas. Steel melting by water gas in ten-ton Siemens' ordinary open-hearth furnace at Leeds forge:

CHARGE 407.

	Tons.	Cwts.	Qrs.
Pig metal	5	8	0
Scrap	3	12	0
Total	9	0	0
Hematite ore	0	13	0

Charge commenced ..... at 10.15 A. M.
Do. finished ..... " 11.03 "
Bath level ..... " 12.40 P. M.
Do. molten ..... " 1.40 "
Finished ready to tap and tapped ..... " 3.52 "

Time occup'ed ..... 4 hours, 49 minutes.

Amount of water gas used 22.5 per cent. } composition of mixed gas.
" " Siemens' gas 77.5 " " }

	Tons.	Cwts.	Qrs.	
Fuel for water gas	2	0	0	coke
	0	18	0	Dowlais dirt or coal.

Total water gas used 87,244 cubic feet.

The managers of several prominent iron manufacturing establishments were present at the demonstration last week, and we hear that, apart from a large number of inquiries, water gas plants for puddling as well as steel making have been ordered by some of the leading members of the trade.

We recommend our readers, who are not properly posted in the latest developments of water gas for metallurgical operations, to communicate with the secretary of the British Water Gas Syndicate, Limited, Leeds, and obtain many important facts and figures bearing on this important economy in iron and steel manufacture.

Pioneers in the Tin-Plate Industry.

The only plant at which sheet tin is being manufactured in North or South America was put in operation this week at the United States Iron and Tin-Plate Works at Demmler station, Third ward, McKeesport. The fact that this company has for the last ten or twelve years been paying nearly $30,000,000 annually to foreign countries, and that not a sheet of tin was being made on this continent, urged the firm, particularly Mr. Cronemeyer, one of the members, to make strenuous efforts toward securing a protective tariff sufficiently high to enable them to compete with the cheap labor of foreign manufacturing cities; their labors have been crowned with partial success, as the clause in the McKinley bill protecting tin-plate has passed the House and bids fair to pass the Senate. If such action be taken, many mills for manufacturing the product will likely spring into existence.

In anticipation of the measure becoming a law, the firm has placed the plant in operation, and it is understood that even if tin-plate is not protected, they will endeavor to continue the manufacture. They have put in a much improved process by Leyshon & Sons, of Tipton, England. The gentleman and one of his sons have been in McKeesport for the past couple of weeks, personally superintending the introduction of the plant, which has been placed in successful operation. The process heretofore used consisted of five operations, two dippings in grease and three in tin. By the new process the same results are obtained in one operation, by inserting a sheet in a solution of tin and palm oil. The cost of manufacture is wonderfully cheapened, and the quality of the product is said to be excellent, either for sheet or turn work.

The greater part of the tin imported to this country comes from South Wales, where the largest mills in the world are located. There are mills in France, Italy, Germany and Russia, but they make scarcely more than is used for home consumption. The import last year is estimated at 6,000,000 boxes, and it is worth about $5 a box. The United States works made tin when the tariff was on it, but was compelled to quit some twelve years ago, when it was removed.—[Pittsburgh Dispatch.

New England Learning from the South and West.

Undignified as "booming" may be, New England towns are being forced to borrow some methods from the South. It is interesting to note that a leading Boston journal, which not so long ago held the position that the Southern "boom" was only ephemeral, now devotes considerable space in every issue to reporting the efforts of Massachusetts towns, through their boards of trade, to retain the manufactories they now have, if not to secure new ones. Our contemporary has not commented upon the fact, but the meaning of the news of this kind which it prints is that New England is putting itself upon guard to keep the South from stealing away more of her factories. By the way, wherever the South is mentioned in this article, the West may also be included.—[Hardware, New York.

THE mammoth structure that will replace the whilom "Madison Square Garden" in New York City will require 3,000,000 pounds of wrought and 590,000 pounds of cast iron. That is equal to 1,750 net tons, which would employ a blast furnace of 159 tons daily capacity, twelve days to produce. Take the thousands of buildings, small and great, into whose construction iron enters, and some idea may be formed of the immense demand for iron for building.

Reduced Rates to Pittsburgh via the Pennsylvania Lines.

Excursion tickets at one fare for round trip will be sold June 20th and 21st, good returning until June 28th inclusive, for the International Sunday-school Convention.

The International Sunday-school Convention will be held at Pittsburgh, June 23d to to 27th. One fare for the round trip via the Pennsylvania Lines.

INDUSTRIAL SUMMARY.

New Enterprises:—

It is probable that a stock company will be organized at Houston, Tex., to erect foundry and machine shops.

The Llano Smelting & Refining Co., lately chartered, will soon commence the erection of a $100,000 plant at Llano, Tex.

The Sullivan Iron Co., of Duluth, Minn., with capital stock of $50,000, has filed articles of incorporation with the Secretary of State.

The Marion Iron & Wood-Working Co., with $20,000 capital stock, has been incorporated at Marion, S. C., by leading local capitalists.

It is reported at Memphis, Tenn., that the W. M. Farrow Fire Arms Works, of Holyoke, Mass., are to be removed to the first named place.

The Hardeman-Willbarger Bridge Co. has been incorporated to build a bridge across Ked river, at Austin, Tex. The capital stock is $50,000.

The Cam-Lock Switch Manufacturing Co. is being organized to establish works in Fort Payne, Ala., for the manufacture of the cam-lock switch.

Bessemer Cornice Works, with a capital stock of $5,000, have been organized at Bessemer, Ala., by W. A. Long, T. J. Cornwall, H. S. Long and others.

At New Birmingham, Tex., E. S. Maunsell, A. Brittin and others have organized a company with $500,000 capital stock to build a 50-ton iron furnace.

The Blacksburg Machine & Iron Works, with $12,000 capital stock, have been organized at Blacksburg, S. C., by J. F. Jones, J. J. Whisonant and others.

The Rome Land Co., Rome, Ga., expect soon to erect an 80-ton charcoal furnace, a coke furnace, car wheel works, car works, a wire mill and a fire-clay works.

E. W. Cole, J. G. Houston, J. H. Eakan and others have incorporated the Napier Iron Co., at Henryville, Tenn., to manufacture iron, steel, charcoal and alcohol.

Dr. W. A. Lash is interested in organizing an iron and steel works at Walnut Grove, N. C. This is an important step toward the development in a rich mineral region.

W. H. Forbes, J. S. May, Philip Engelskirger and others, have incorporated the National Saw Co., at Newport, Ky., to manufacture saws. The capital stock is $3,000,000.

The Pacific Iron Works Co. have filed articles of incorporation at San Francisco. The directors are Ira P. Rankin, Willis G. Dodd, John Taylor, John R. Cross and S. O. Putnam.

H. S. Chamberlain, O. L. Hurlburt, T. H. R. McIntyre and others have incorporated at Chattanooga, Tenn., the Chickamauga Iron Co., with the privilege of erecting and operating blast furnaces.

The Gadsden Bar & Steel Mill Co., with a paid-up capital stock of $150,000, have been incorporated at Gadsden, Ala. Work on the new plant will begin at once, and 300 men will be employed when the plant is finished.

A contract has been closed with the Railroad & Improvement Co., of Florence, Ala., to locate a large foundry for the manufacture of stone fronts, architectural iron castings, etc., at that place. The plant will cost $100,000.

A corporation has been formed at Springfield, Mass., with a capital stock of $10,000, to manufacture the Bartlett automatic elevator gate. Officers are: President, F. K Bartlett; Treasurer, W. F. Hurd; Directors, these officers with F. A. Bartlett.

The Macon Stamped & Pieced Tinware Co have been incorporated at Macon, Ga., with a capital stock of $100,000. M. Nussbaum, R. H. Plant, L. E. Culver and others, are the incorporators. This company intended also to manufacture stoves.

The Ball Turn Machine Co. is a new organization at Portland, Me., to develop machinery for the manufacture of boots and shoes, with a capital stock of $1,250,000. Horace M. Oliver, of West Medford, Mass., is president, and G. W. Day, of Haverhill, Mass, Treasurer.

The Jones Special Machine Co. has been organized at Portland, Me., for the purpose of manufacturing sewing and embroidery machines. The corporation has a capital stock of $100,000, and its officers are: President, J. Thomas Jones, of Utica, N. Y.; treasurer, Arthur G. Hosmer, of West Newton, Mass.

The Cumberland Iron Co. has been incorporated at Nashville, Tenn, by M. T. Scott and L. M. Graham, of Bloomington, Ill, and J. C. Steger, T. M. Steger and J. C. Symmes. The old Cumberland Iron Works, one of the oldest iron plants in that region, and which has been idle of late, is to be again started up by this company.

It is reported that the Barrow Land Co., at Barrow on Potomac, Ky, controlling about 52,000 acres of iron ore and timber land, and a capital stock of $5,000,000, has the location of the following industries in contemplation: Two iron furnaces, basic steel plant and rolling mill, by the Barrow Steel Co.; chemical works, the Barrow & Charcoal Chemical Co., marine railway and docks, machine shops, etc., the Barrow Shipbuilding Co.; tin plate mill, the Barrow Tin Plate Co.

The following are among the recent Illinois incorporations: Joseph Breitenmoser Milling & Bicycle Co, East S. Louis; to manufacture devices to improve bicycles and other machinery; capital, $3,350,000; incorporators, T. H. Miller, R. H. Miller and J W. Hertz.—Universal Brakebeam Co., Chicago; to manufacture brakebeams for railroads; capital, $1,000,000; incorporators, D. P. Slattery, W. W. Johns and E. Glogau.—Columbia Sewing Machine Attachment Co., Chicago; to manufacture button-hole attachments; capital, $100,000; incorporators, J. W. Blodgett, John Van Omeran.—Springfield Boiler & Manufacturing Co., Springfield; to manufacture steam boilers; capital, $18,000; incorporators, John McCreery, A. L. Ide, B. H. Ferguson and others.

Enlargements, Additions, Removals, Etc.:—

The Lane Manufacturing Co., Montpelier, Vt, manufacturers of woodworking machinery, are building a new pattern shop and foundry, and making

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extensive additions to their machine shop, which, when completed, will give them greatly increased facilities.

The Shiffler Bridge Co., Pittsburgh, Pa., will build a blacksmith and forge shop and make other improvements.

The Shenandoah Furnace Co, Shenandoah, Va., will erect a rolling mill having a monthly capacity of 600 tons of finished iron.

The Golden Foundry & Machine Co., at Columbus, Ga., will build a machine shop, 40′x200′; foundry, 80′x150′, and storeroom 60′x100′.

Andrews Bros. & Co., proprietors of Hazelton Iron Works and Hazelton Furnace, of Hazelton, O., are erecting a new foundry, besides making other extensive repairs.

The Covington Improvement Co., Covington, Ky., are preparing plans for a new iron furnace which will be 14x70 feet, and have a capacity of 75 tons per day; also for a rolling mill with a capacity of 50 tons per day.

J. H. Gill, of Raleigh, N. C., is arranging for the removal of his foundry and machine shop to Anniston, Ala. The new buildings are in course of erection, and the capacity of the new plant is to be considerably greater than the old one. The works will be in operation by August.

The Americus Manufacturing & Improvement Co. will, it is claimed, increase its capital stock to $1,000,000 if it secures control of all the improved real estate in and about Americus, Ga. The purpose of the increase is to secure the establishment of new industries, including $250,000 car works and other enterprises.

Furnaces and Works Starting Up:—

McCoy & Linn's Hecla furnace, at Milesburg, Pa., which went out of blast in March, is again in operation.

Furnace C. of Carnegie Bros. & Co., Limited, at Braddock, Pa., which has been undergoing repairs, was blown in again last week.

The Claire Furnace Co.'s furnace, at Sharpsville, Pa., which was blown out April 3d for repairs, has been relined and put in best condition. This furnace was successfully blown in June 2d, and is running satisfactorily.

This week the only plant in America at which tin-plate is manufactured, was put in operation by the United States Iron & Tin-Plate Works, at Demmler, Pa. The prospects of passing the McKinley bill protecting tin-plate has encouraged the firm to put the plant in operation. The process employed is that of Leyshon & Sons, of Tipton, Eng.—[American Manufacturer.

Fires and Accidents:—

I. A. Finch & Co.'s machine shop, at Scranton, Pa., was damaged $20,000, by fire.

The hammer shops at Pullman, Ill., were recently damaged to the amount of $1,500, by fire.

A fire destroyed the Iowa City Foundry, Iowa City, Ia., causing a loss of $3,000 above insurance.

Wales & Eccleston's foundry, at Nebraska City, Neb., was damaged $2,000, by fire, partly insured.

A mysterious fire destroyed the Gainesville (Fla.) Foundry & Machine Shop; loss, $4,000; no insurance.

The foundry and machine shop, of Christian & Croot, Iowa Falls, Ia., was burned; loss $6,000; insurance $1,200.

The foundry of the Whittier Machine Co., of South Boston, Mass., was destroyed by fire on the 8th inst. The loss will probably reach $40,000; insurance, $26,000.

General Industrial Notes:—

The Fulton Iron Works, of St. Louis, Mo., are about to make four flywheels, 24 feet in diameter, for the Broadway cable road which will weigh, when completed, sixty tons each. Each wheel will be made in ten sections.

The Skinner Chuck Co., New Britain, Conn., manufacturers of Skinner's lathe and drill chuck, report that their business is very good at present, and that they are building a new three-story brick factory, 40x80 feet, to accommodate their rapidly increasing trade.

The Overman Carriage Co., Cincinnati, O., write us that their trade this season has been double that of any previous year. They find their factory too small to accommodate them, and on the 1st of September they will add another story and other outside additions. Their export trade this season has been treble that of any previous year, and is continuing to increase in the same ratio.

W. H. Bowe & Co., wholesale carriage manufacturers, Cincinnati, O., are looking for new quarters in which they can double their capacity. They say that their trade on surries and phaetons has increased to such an extent that they have been compelled to secure additional room outside of their factory in which to run extra forges for ironing them. The sale of their light, one-horse cut-under surries has exceeded their most sanguine expectations.

The Jeffrey Manufacturing Co., of Columbus, O., inform us that they are very busy in all departments, especially so in their chain elevating and conveying machinery line. Their order books are full of orders, and the demand is constantly on the increase. They have recently made a large number of new chain link patterns, which are shown in their new catalogue, and those who use chain belting will find it to their interest to send for a copy.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 21st day of June, 1890, for furnishing and delivering at freight depot in city where required, fire-proof safes etc., required for the United States Government buildings at the following cities: Atlanta, Ga., Augusta, Me., Cleveland, O., Columbus, O, Concord, N. H, Des Moines, Ia, Jackson, Tenn., Knoxville, Tenn., Kansas City, Mo., Lincoln, Neb., Lexington, Ky., Minneapolis, Minn., Newark, N. J., New Haven, Conn., Oshkosh, Wis., Omaha, Neb., Reading, Pa., St. Paul, Minn., Shreveport, La, Toledo, O. and Utica, N. Y.

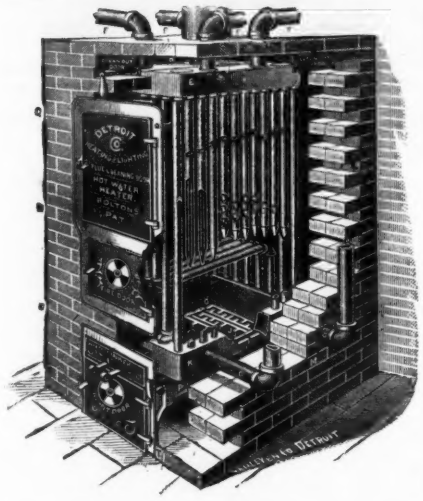
W. J. Burton & Co., Detroit, Mich., manufacturers of the "Eastlake" metal shingle, inform us that they have just received contract for roofing the Holmes barn near Detroit (with the "Eastlake" metal shingles), which will be one of the largest and finest barn buildings in the southern part of Michigan. Mr. Holmes informs them that after receiving samples of various other roofing materials and with a fair comparison, he decided that the "Eastlake" metal shingles, manufactured by them, excelled them all as a roofing material, and awarded them the contract for the roof without any solicitation on their part further than a circular with quotations and a sample of their goods. The manufacturers also say that the demand for them is rapidly increasing, and they expect to more than treble the output of last season.

The Bradford Mill Co., Cincinnati, O., manufacturers of all kinds of flour mill machinery, are making a specialty of a new reel for bolting purposes, which is meeting with much favor from the trade generally. The following letter from Mr. W. F. Putnam, the head miller of the Cleveland (O.) Milling Co., to the makers, speaks for itself, and is as follows: "I have finished my investigation of reels and have concluded the test of the different machines that I had in mind as suitable for a complete bolting system. The Dunlap bolt is the one I have selected to take the place of the present reels; you can ship to the Cleveland Milling Co. fifty-three (53) Dunlap bolts, to be equal in construction and finish to the one you furnished me to be used in a competitive trial; and on the terms indicated, in our bid for the work."

The Garry Iron & Steel Roofing Co., Cleveland, O, announce a new departure in the application of roofing felt, which they are now introducing into the market, and which is claimed to be a great improvement over the old-fashioned methods of lining roofs. They have a process by which felting can be fastened securely and permanently to the iron, thus enabling felt to be used under iron laid on buildings without sheathing boards. The felting thus applied will prevent the accumulation of frost and moisture on the under side, thus doing away with all dripping, which is very objectionable. For this reason it is desirable for buildings exposed to gases, acids and steam, such as rolling mills, blast furnaces, glass manufactories, boiler houses, etc. It can also be applied to corrugated iron and various other kinds of roofing.

James O'Connor, No. 141 West 5th street, Cincinnati, O., die sinker, general engineer and stamp cutter, and maker of steel stamps, dies, alphabets, figures, badges, etc., is doing a large and increasing business, and feels that it may be necessary for him to find more room and increase his facilities for carrying on his business. He has had and continues to receive many orders from the Western section of our country, extending to and including California, as well as from the South, including New Orleans and Florida. He has had large orders from Nova Scotia and Upper and Lower Canada, and also within a few days from Havana, Cuba. Mr. O'Connor is a man full of energy, and gives close attention to his business to see that all articles going from his establishment are of the best material and the work well done in every particular. All inquiries and orders sent will receive prompt attention.

BOLTON



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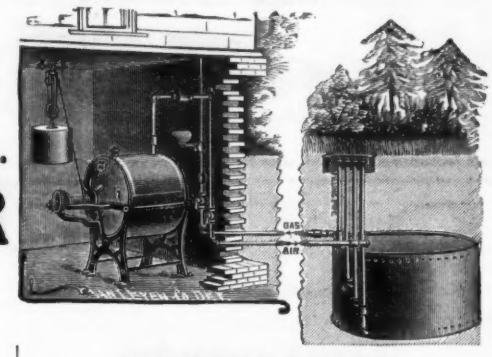

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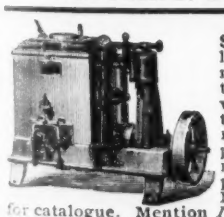

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Utah is entering on her Iron Age. She needs and would make profitable a rolling mill and general iron manufactory on a good sized scale, costing anywhere up to $500,000 or $1,000,000. The iron ore deposits are believed to be the largest in the United States. Near Iron Springs is a deposit of millions of tons of ore which Prof. J. S. Newberry, of Columbia College, pronounces the best in this country. Averages 60 per cent. in metallic iron. Heretofore the want of coke has been the obstacle, but this year (1890) coke from our own Castle Gate coal has been successfully used, and we believe the solution of the problem is at hand. A fair assay of this ore runs: metallic iron, 62.6 per cent.; phosphorus, none; sulphur, 12 per cent.; silica, 4.8 per cent. Another: 61.53 per cent. metallic iron; phosphorus, none; sulphur, none; silica, 5.5 per cent. There is no titanic acid. Plenty of charcoal can be made close at hand. Abundance of coal near by for all purposes but coking. The coking coal does not lie so near the iron; it is hauled some distance. Near the iron deposits are extensive deposits of manganese. Deposits of limestone near by go in lime 80 per cent.

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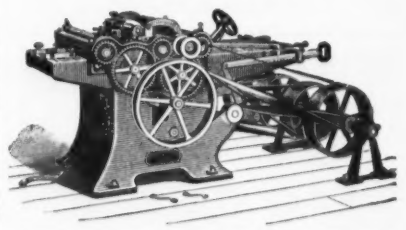

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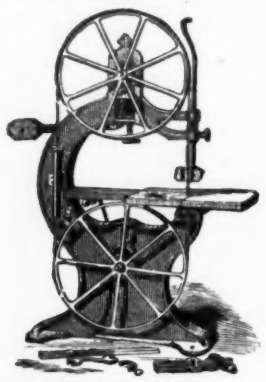

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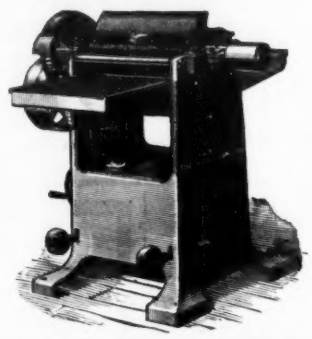

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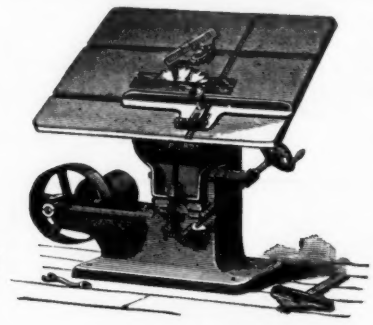

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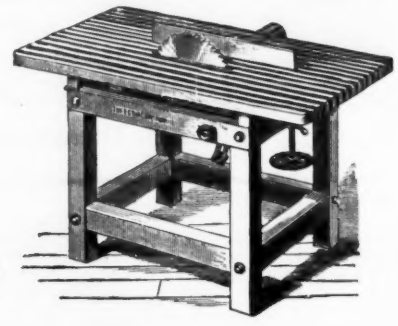

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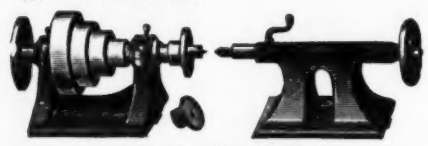

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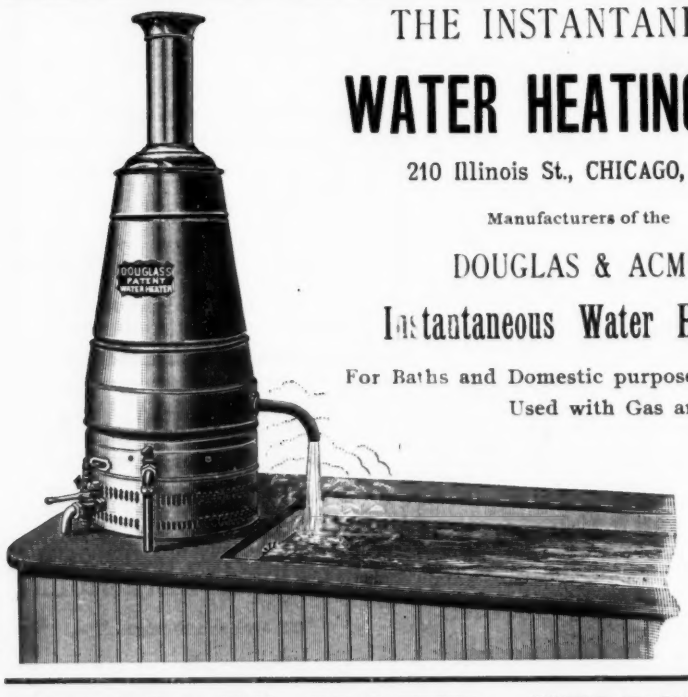

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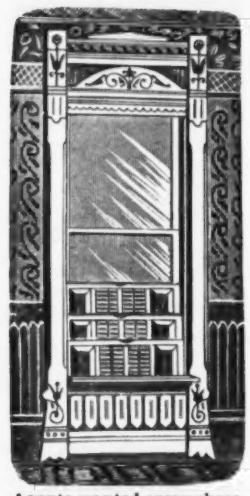

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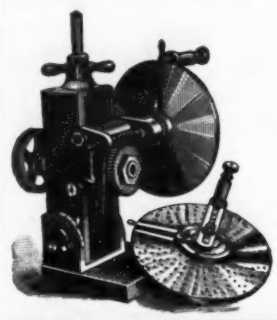

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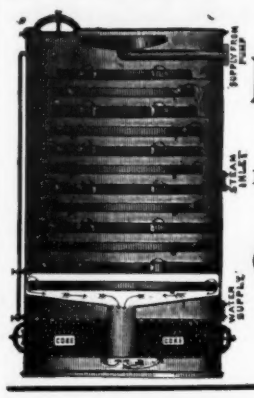

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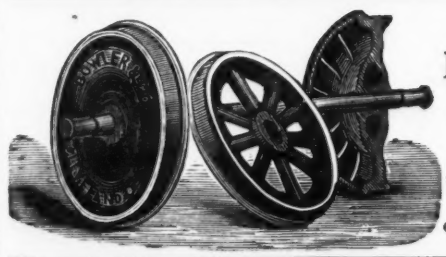

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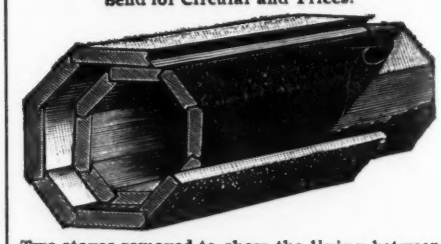

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⅝, ¾ and ⅞ by ⅜ to ⅛ inch	2 25

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1 to 1⅞ inch	1 85
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2¾ to 3¼ inch	2 35
3⅜ to 4 inch	2 85
4⅛ to 4⅝ inch	3 35
4¾ to 5 inch	3 55

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⅜ to 1¼ inch	2 25
½ to ¾ inch	2 45
⅞	2 65
1	3 05

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1½ to 3 inch	2 95
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⅞	3 35
1	4 85

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1½ to 6 by ¼ and 5-16 inch	2 05
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⅞, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
¾, Nos. 13 to 15	3 35
¾, Nos. 16 to 18	3 55
¾, Nos. 19 and 20	3 65
¾, No. 21	3 75
¾, No. 22	3 85
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 75
11-16, Nos. 19 and 20	3 85
11-16, No. 21	3 95
11-16, No. 22	4 05
⅝, Nos. 13 to 15	3 85
⅝, Nos. 16 to 18	4 05
⅝, Nos. 19 and 20	4 15
⅝, No. 21	4 25
⅝, No. 22	4 35
⅝, No. 23	4 55

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 25
1¼ to 6 by Nos. 11 and 12	2 35
1 to 1¾ by ⅛ to 3-16 in	2 45
1 to 1¾ by Nos. 11 and 12	2 55
⅞ and 13-16 by ⅛ to 3-16 in	2 75
⅞ and 13-16 by Nos. 11 and 12	2 85
¾ and 11-16 by ⅛ to 3-16 in	3 05
¾ and 11-16 by Nos. 11 and 12	3 15
⅝ and 9-16 by ⅛ to 3-16 in	3 35
⅝ and 9-16 by Nos. 11 and 12	3 45
⅛ by ⅜ to 3-16 in	3 65
⅛ by Nos. 11 and 12	3 75

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 85
⅛ inch, " " " 13 and 14	3 05
¼ inch, " " " 11 and 12	3 15
¼ inch, " " " 13 and 14	3 35

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 80
No. 18 to 21	3 00
No. 22 to 24	3 20
No. 25 to 26	3 35
No. 27	3 45
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	3 00
Shell	3 40
Flange	3 70
Marine Flange	4 10
Fire Box	4 80

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6¼ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery	base price,	3 00
Tire	"	3 00
Spring	"	3 50
Sleigh Shoe	"	3 00
Toe Calk	"	3 25
Cutter Shoes, tapered and burr.	"	3 25

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ⅜, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	13 00
Iron axles	22 00
Axle turnings	13 50
Wrought turning (free from cast)	12 00
Cast borings	9 00
Uncut wrought iron boilers	13 00
Steel boiler plates	17 00
Grate Bars	9 00
Pipes and flues (Clean)	12 00
Tank iron	12 00
Hoop and band iron	9 00
Sheet iron	10 00
Wrought drillings	11 00
Malleable iron	10 00
	GROSS TONS
Old iron T rails	22 50
Old steel rails	19 50
Old car wheels	18 50
Old copper	½ ℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

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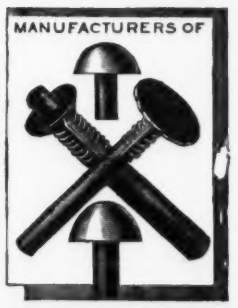

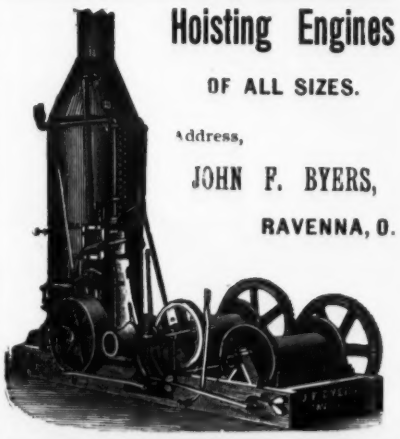

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Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9¼

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard .dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 40
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¼@10¼

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers. .....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 45
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill .....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard.....dis 55@ 58 5
Cleveland.....dis 55@ 58 5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, C. F. F.	FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 40@45

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¼	3⅛
Hexagon	15⅝	11⅛	8⅝	6	5¾	5¼	5
Washers	9	8	7	5	4½	4¼	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12@24
Graphite Rubber.....₩ lb 9

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¾

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay .....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls		21c@29c
No. 18 " " ¼ and ⅛ "		18c@28c
No. 36 " " ¼ and ⅛ "		16c@27c
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)		11½c
3-Ply " 1 lb Balls		12@12¼c
3-Ply " 1½ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

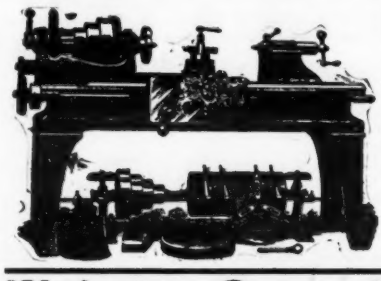
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " " .....dis 10
Alligator " " " .....dis 40



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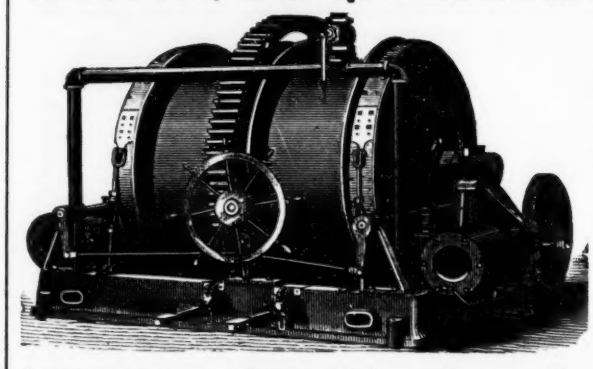

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PRICE $35.00.

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HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10

Sargent's list

Carriage, common, new list.....dis 70&12½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&5
Loose joint, jap.....dis 70&5
Loose joint, jap. with acorns.....dis 7c&5
Loose pin, acorns.....dis 70&5
Loose pin, japanned acorns.....dis 7c&5
Loose pin, acorns, jap. plated tips.....dis 70&5
Wrought steel—
Wrought, fast joint, narrow.....dis 70&5
Wrought, fast joint, broad.....dis 7c&5
Wrought, loose joint, broad.....dis 7c&5
Table Butts, back flaps, etc.....dis 70&5
Regular inside blind.....dis 7c&5
Light inside blind.....dis 70&5
Loose pin.....dis 70&5
Light loose pin.....dis 7c&5

Chains.

Revised List.

Trace, 6¼-10-2.....℔ pair 1.03
Trace, 6¼-10-3.....℔ pair .92 } .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ 05¼@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed 8 inch	4 00	4 50	5 00
10 and 11½ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 50&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ℔ M.	23	24	25	26	28	dis 25&10
Putnam, ℔ M.	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze.....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@$...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....℔ gross $15 00

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

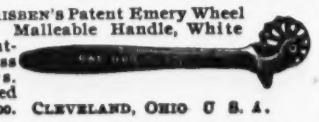
Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds dis 70&10&10
Steel carpet tacks all kinds.....dis 70&10&10
Swedes iron carpet tacks, all kinds dis 70&10&10
Swedes iron tacks.....dis 70&10&10
Swedes iron Upholsterers' tacks..dis 70&10&10
Tinned Swedes iron tacks.....dis 70&10@10
Tinned Swedes iron Upholsterers' tacks.....dis 70&10&10
American iron cut tacks.....dis 67½&10&10
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 65
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10&10
Basket nails.....dis 66&10&10
Chair nails.....dis 66&10&10
Common and patent brads.....dis 66&10&10

W. W. BRISBEN'S Patent Emery Wheel Dresser, Malleable Handle, White Hard Cutters, Brass Bearings. Warranted

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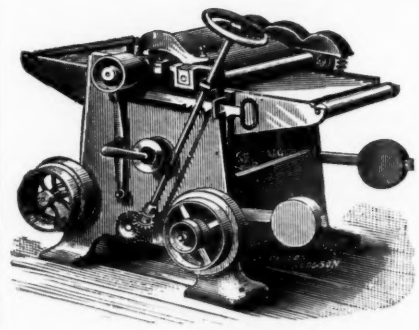
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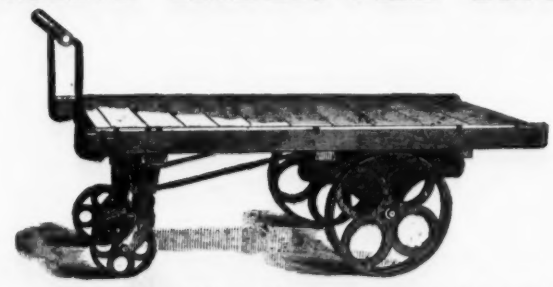
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2 35 "	Plain, side crank	275
1 25 "	Plain, center crank	260
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1 20 "	Plain, side crank	180
1 16 "	Plain, center crank	180
1 14 "	Plain, side crank	100
1 12 "	Plain, center crank	125
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1 10 "	Plain, side crank	100
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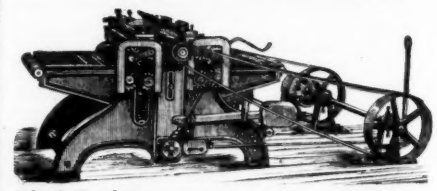

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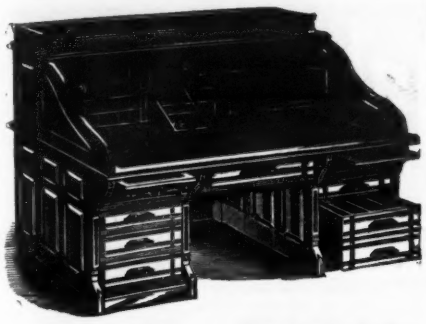

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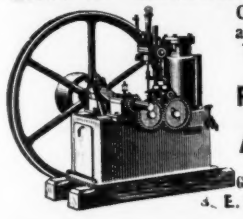

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Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 45 a m	*6 25 p m
Marietta Express.....	†11 15 a m	†2 25 p m
Valley Junction Express...	*4 15 p m	*10 25 a m
Cleve. and Canton Express	*7 05 p m	†8 20 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	10 10 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 00 a m	5 40 p m
	3 25 p m	10 10 a m

d Daily. Other trains except Sunday.

Pullman Palace Sleeping Cars daily between Cleveland, Columbus and Cincinnati. City ticket office, Weddell House corner.

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Cleveland & Marietta Ry.

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The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the South east.

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	Depart.
No. 62, Accommodation.....	† 6 05 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 45 p m
No. 73, Leavitsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

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L. P. FARMER, Gen. Pass. Agt., New York

W. C. RINEARSON, Ass't G. P. A., Cleveland, O.

M. L. FOUTS, City Pass. and Ticket Agt., 141 Superior st., Weddell House, Cleveland, O.

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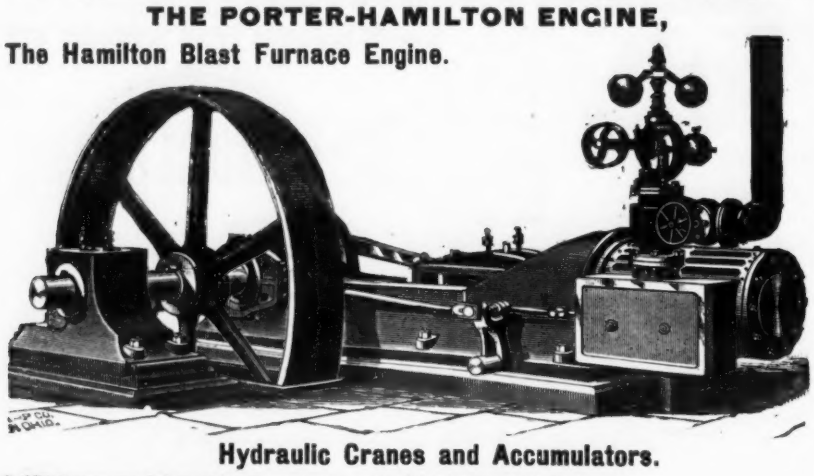

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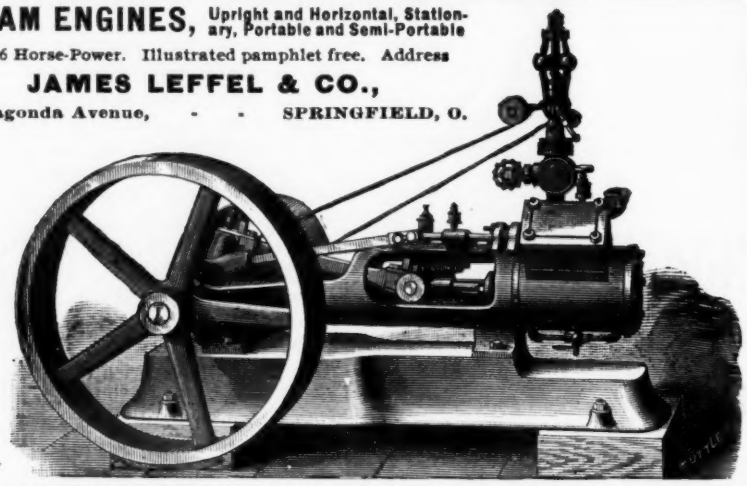

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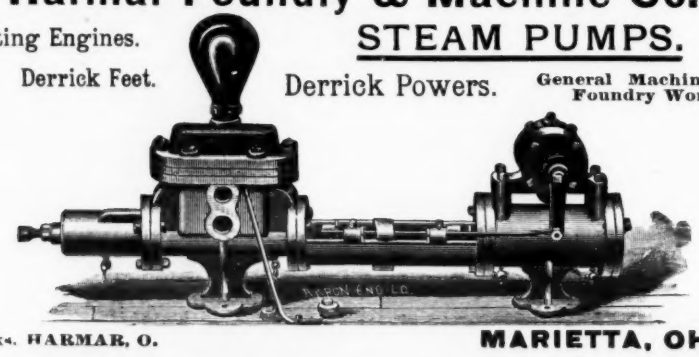

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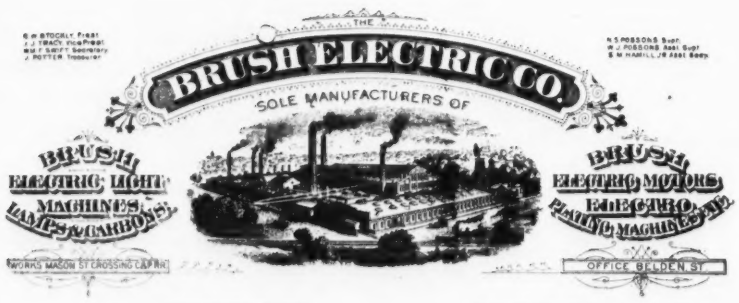
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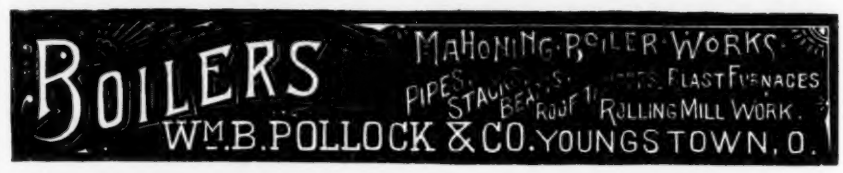
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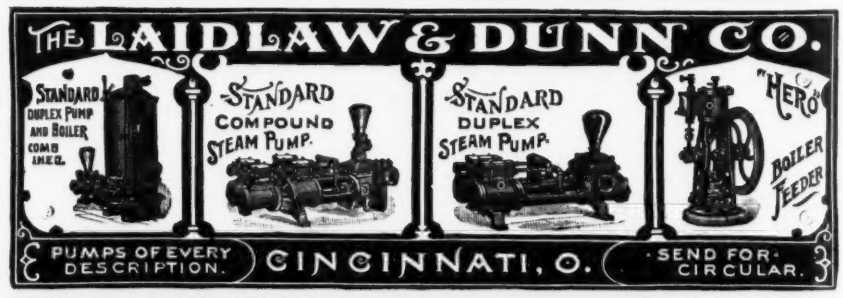

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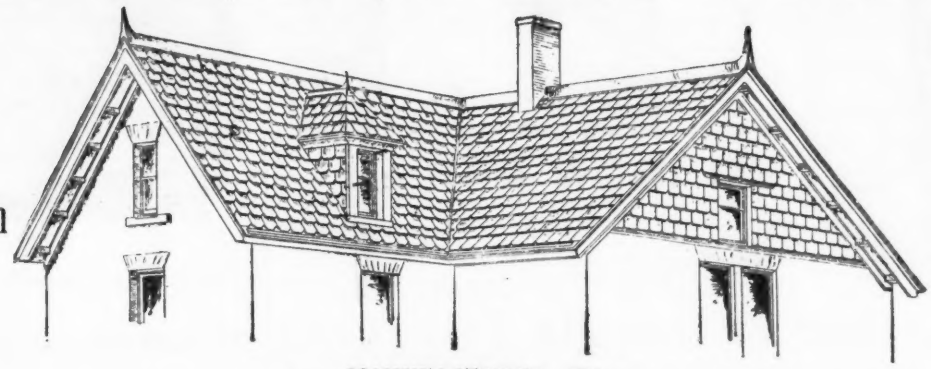

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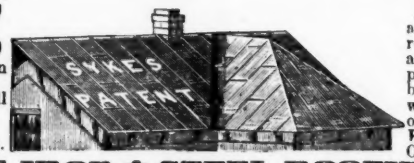

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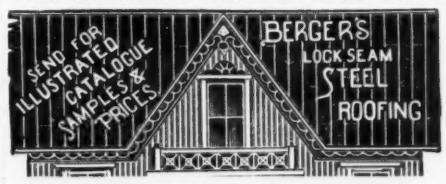

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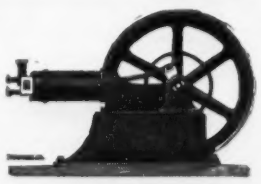

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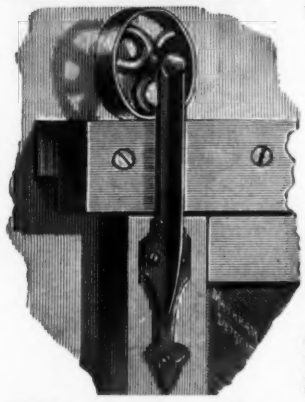

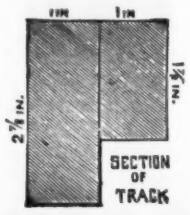

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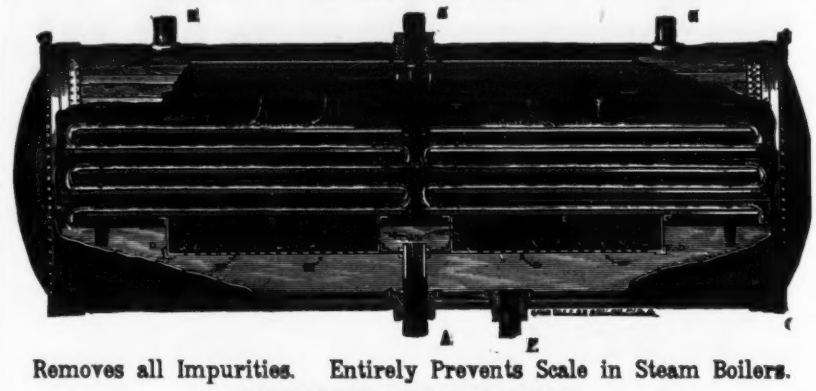

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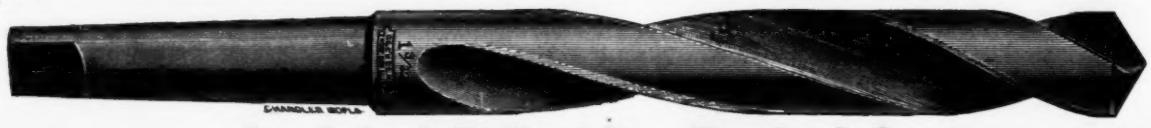

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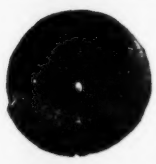

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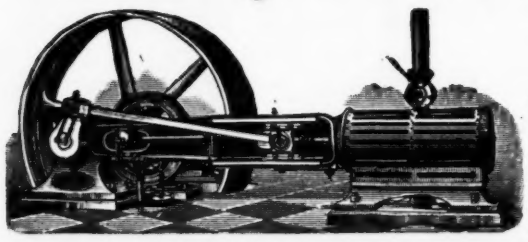

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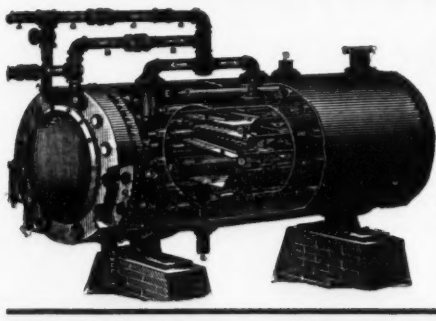

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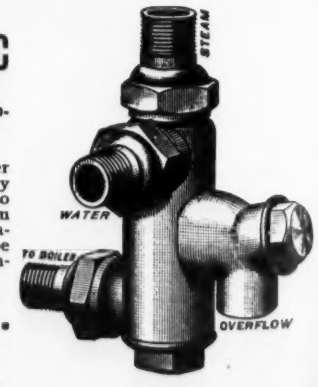

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